臺灣總督府

中央研究所林業部報告

比律賓產木材ノ解剖的識別ニ關スル研究

第貳號

IDENTIFICATION

OF

PHILIPPINE WOODS

BY

ANATOMICAL CHARACTERS

SUPPLEMENT TO THE

Anatomical Characters and Identification of Formosan Woods etc.

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by

RYOZO KANEHIRA

Director of the Department of Forestry

Government Research Institute,

TAIHOKU, FORMOSA

1924

臺灣總督府中央研究所

大正十三年三月

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Introduction

For the sake of comparison with Formosan Woods, I have investigated the anatomical characters of some Philippine woods. The wood specimens used in this study were bought from the Bureau of Forestry, Manila, in March, 1912. The species number 155, representing 108 genera and 41 families of dicotyledons and 5 species and 4 genera of gymnosperms. The Bureau of Forestry specimen number follows my description of the wood of each species.

Part I of this paper deals with the anatomical characters of each species and is arranged in the order of Bentham and Hooker's system; in Part II, I give an anatomical key to the woods. Part III is a summary of the results of this work.

For preparing the slides, the wood was boiled with glycerine during several days, the harder woods were soaked in 20 to 35 per cent solution of hydrofluoric acid for three weeks to three months, the percentage strength of the solution depending upon the hardness of the woods. After the treatment with acid or glycerine, the material was thoroughly washed. It was cut with a hand microtome in transverse, tangential, and radial sections, usually stained with fuchsin, and mounted in balsam. For the measurement of the wood elements and observation of their characters Schulze's method has been followed. The identifications of the Philippine woods used in this study were made by Mr. E. D. Merrill, of the Bureau of Science, and Mr. Luis J. Reyes, of the Bureau of Forestry, Government of the Philippine Islands.

R. Kanehira.

February 1924, *Taihoku, Formosa.*

PART I
ANATOMICAL CHARACTERS OF PHILIPPINE WOODS

Dilleniaceae

1) **Dillenia** *sp.*

Pores evenly distributed, number per square millimeter 9 to 14, their diameter 80 to 200μ; length of the vessel segments 1,400 to 1,900μ, their perforation scalariform, cross bars very many. Wood fibers 28-35μ in diameter, length 2,000 to 3,100μ, wall 8 to 10μ thick. Metatracheal parenchyma one cell wide in radial direction. Pith rays heterogeneous, in two modifications: uniseriate ray cells upright, polyseriate rays up to 10 cells wide, height indefinitely great; cells often with dark reddish substance. No. 1223 T. S.

Anonaceae

2) **Cyathocalyx globosus** *Merrill*

Pores evenly distributed; number per square millimeter 6 or 7, solitary or 2 to 4 connected; solitary pores oval or elliptic in outline, their diameter radially 130 to 250μ, tangentially 100 to 200μ; length of the vessel segments 200 to 400μ, end walls horizontal or slanting, their perforation simple; with very many small slit-like bordered pits where they are in contact with each other. Wood fibers 15 to 20μ in diameter, length 500 to 1,100μ, wall 4 to 5μ thick. Wood parenchyma metatracheal and scattered; metatracheal bands regularly distanced from each other, 1 to 4 cells wide in radial direction. Pith rays nearly homogeneous, 2 to 7 cells wide in radial direction, up to 95 cells high. No. 17567 B. F.

3) **Polyalthia flava** *Merrill*

Pores evenly distributed, number per square millimeter 9 to 12, solitary or 2 or more connected; solitary pores are elliptic in outline, their diameter radially 70 to 140μ, tangentially 60 to 100μ; length of the vessel segments 270 to 700μ, side walls 3 to 5μ, common boundary walls of two vessels 5 to 7μ thick. Wood fibers 20 to 25μ in diameter, length 750 to 1,500μ, wall 3 to 4μ thick. Wood parenchyma metatracheal and scattered; metatracheal bands 5 to 10 fibers distant from each other, 1 to 3 cells wide in radial

direction, arranged in regular tangential lines. Pith rays heterogeneous, 1 to 8 cells wide, height indefinitely great (1.5 millimeters). No. 17531 B. F.

4) **Polyalthia oblongifolia** *C. B. Robinson*

Number of pores per square millimeters 12 to 15, solitary or in groups, in the latter case 2 to 4 connected in radial, sometimes circular groups; solitary pores are oval or round in outline, their diameter 70 to 140μ; length of the vessel segments 550-750μ; with very many bordered pits where they are in contact with each other, the diameter of borderd pits being 3 to 4μ. Wood fibers 20 to 25μ in diameter, length 500 to 1,600μ, wall 3 to 4μ thick- Wood parenchyma metatracheal and scattered; metatracheal bands one, some. times two cells wide in radial direction. Pith rays heterogeneous, 1 to 11 cells wide, height indefinitely great. No. 17473 B. F.

5) **Polyalthia** *sp.*

Number of pores per square millimeter 20 to 30, mostly connected in radial direction, their diameter radially 60 to 120μ, tangentially 50 to 100μ; length of the vessel segments 200 to 400μ. Wood fibers 12 to 14μ in diameter, length 500 to 1,100μ, wall 2 to 3μ thick. Wood parenchyma metatracheal and scattered; the former 1 to 3 cells wide, arranged in regular tangential line. Pith rays heterogeneous, 1 to 7 cells wide. No. 7106 B. F.

Bixineae

6) **Ahernia glandulosa** *Merrill*

Pores distributed in radial direction, usually 2 to 6 connected radially, number per square millimeter 18 to 24; solitary pores are elliptic in outline, their diameter radially 100 to 200μ, tangentially 80 to 140μ; length of the vessel segments 700 to 1,200μ their perforation simple, side walls 3 to 4μ, co mmon boundary walls of two vessels 5 to 7μ thick; with very many bordered pits where they are in contact with each other, bordered pits angular in outline, their diameter 8μ. Wood fibers arranged in radial direction, 20 to 25μ in diameter, length 1,200 to 2,200μ, wall 3 to 4μ thick. Wood parenchyma rather scarce. Pith rays heterogeneous, 1 to 3 fibers distant from each other, 1 to 4 cells wide, up to 50 cells high; cells very often with crystals of calcium oxalate. No. 2100 T. S.

7) **Hydnocarpus heterophylla** *Blume*

Pores mostly connected in radial direction, number per square millimeter

70 to 90, rather evenly sized, solitary pores are round in outline, their diameter 30 to 65μ; length of the vessel segments 1,000 to 1,600μ, end walls slanting, their perforation scalariform, cross bars 6 to 15, side walls 3 to 5μ, common boundary walls of two vessels 5 to 6μ thick; with many bordered pits where they are in contact with each other, arranged in regular alternating fashion, pits being horizontally elongated. Wood fibers with small cavities, arranged in radial direction, 20 to 25μ in diameter, length 1,200 to 2,500μ, wall 5 to 7μ thick. Wood parenchyma scattered. Pith rays heterogeneous, arranged in regular palisade, 1 to 3 fibers distant from each other, uniseriate, sometimes 2 or 3-seriate, height indefinitely great. No. 22514 B. F.

Guttiferae

8) **Calophyllum Blancoi** *Planchon and Triana*

Pores arranged in radial or diagonal direction, number per square millimeter 4 to 7, usually solitary, elliptic or oval in outline, their diameter radially 120 to 250μ, tangentially 100 to 200μ; length of the vessel segments 550 to 1,000μ. Wood fibers 14 to 16μ in diameter, length 900 to 1,600μ, wall 3μ thick. Wood parenchyma metatracheal; conspicuous on cross section, in wavy tangential lines, 3 to 9 cells wide in radial direction. Pith rays heterogeneous, uniseriate, rarely partly biseriate, 5 to 20 cells high, sometimes 2 rays connecting vertically, cells with reddish substance. No. 17535 B. F.

9) **Calophyllum Inophyllum** *Linnaeus*

A tree up to 130 centimeters in diameter, but generally with a very short and irregular bole.

Pores evenly distributed, number per square millimeter 2 to 4; tyloses present, usually solitary, oval or round in outline, their diameter 160 to 320μ; length of the vessel segments 200 to 550μ. Wood fibers 15 to 18μ in diameter, length 550 to 1,100μ, wall 3 to 4μ thick. Wood parenchyma metatracheal and scattered; metatracheal bands 1 to 4 cells wide in radial direction, cells with dark reddish substance. Pith rays heterogeneous, 1 or sometimes 2-seriate, 1 to 9 cells high; with dark reddish substance. Museum Plank No. 44.

10) **Cratoxylon floribundum** *F.-Villar*

Pores evenly distributed, number per square millimeter 13 to 16, solitary or in groups, in the latter case 2 to 4 connected; solitary pores are

oval or elliptic in outline, their diameter radially 70 to 150μ, tangentially 60 to 120μ; length of the vessel segments 200 to 350μ, their perforation simple; with very many bordered pits where they are in contact with each other, the diameter of border being 8μ. Tracheids 200 to 350μ long. Wood fibers 14 to 16μ in diameter, length 650 to 1,100μ, wall 4μ thick. Wood parenchyma paratracheal and metatracheal; in the latter case 2 to 4 cells wide in radial direction, arranged in regular tangential lines. Pith rays heterogeneous, mostly of procumbent cells, 1 to 3 cells wide, up to 27 cells high; cells with dark reddish substance. No. 7107 B. F.

11) **Kayea paniculata** *Merrill*

A tree up to 50 centimeters in diamter.

Pores evenly distributed, number per square millimeter 17 to 22, mostly solitary, oval or elliptic in outline, their diameter radially 90 to 180μ tangentially 80 to 160μ; length of the vessel segments 400 to 800μ, end walls horizontal or slanting, their perforation simple. Wood fibers 16 to 22μ in diameter, length 700 to 1,300μ, wall 3 to 4μ thick. Wood parenchyma metatracheal, very conspicuous on cross section, 5 to 8 cells wide in radial direction. Pith rays heterogeneous, 1 to 4 cells wide, up to 30 cells high; cells with dark reddish substance. No. 13304 B. F.

12) **Garcinia dulcis** *Kurz*

A tree up to 60 centimeters in diameter.

Pores evenly distributed, number per square millimeter 6 to 9, solitary or 2 to 8 connected radially, solitary pores are oval or elliptic in outline, their diameter radially 100 to 200μ, tangentially 80 to 150μ; length of the vessel segments 750 to 1,200μ; with very many bordered pits where they are in contact with each other, the diameter of border 5 to 7μ. Tracheids 1,000 to 1,500μ long. Wood fibers with very small cavities, their diameter 16 to 22μ; length 2,000 to 3,000μ, wall 7 to 10μ thick. Wood parenchyma paratracheal and metatracheal; in the latter case 1 to 4 cells wide in radial direction. Pith rays heterogeneous, mostly of procumbent cells, 1 to 2-seriate, height indefinitely great. No. 7103 B. F.

13) **Garcinia Benthami** *Pierre*

A tree up to 40 centimeters in diameter.

Number of pores per square millimeter 13 to 18, usually solitary or 2

connected, round in outline, their diameter 70 to 150μ; length of the vessel segments 550 to 900μ, end walls horizontal, their perforation simple; the inner surface of the wall with striations. Wood fibers with very narrow cavities, 15 to 20μ in diameter, length 1,000 to 2,000μ, wall 6 to 10μ thick. Wood parenchyma paratracheal and metatracheal, the latter rather conspicuous on cross section, arranged in wavy tangential lines, 1 to 4 cells wide in radial direction. Pith rays heterogeneous, 1 to 4 cells wide, height indefinitely great. No. 22513 B. F.

Dipterocarpaceae

14) **Anisoptera thurifera** (*Blanco*) *Blume*

A tall straight tree, up to 200 centimeters in diameter.

Pores evenly distributed, number per square millimeter 7 to 10, tyloses present, mostly solitary, their diameter radially 130 to 200μ, tangentially 120 to 230μ; length of the vessel segments 350 to 700μ, end walls horizontal or slanting, their perforation simple. Wood fibers 20 to 25μ in diameter, length 1,400 to 2,700μ, wall 5 to 8μ thick. Wood parenchyma paratracheal and metatracheal. Pith rays heterogeneous, 1 to 5 cells wide, height indefinitely great. No. 17585 B. F.

15) **Dipterocarpus grandiflorus** *Blanco*

Vertical resin ducts present.

Pores evenly distributed, number per square millimeter 3 to 5, tyloses sometimes present, usually solitary, sometimes connected; solitary pores are oval or round in outline, their diameter radially 150 to 300μ, tangentially 140 to 280μ; length of the vessel segments 400 to 900μ. Tracheids 800 to 1,300μ long, mostly present near vessels. Wood fibers with small cavities, 20 to 25μ in diameter, length 1,700 to 2,700μ, wall 6 to 9μ thick; with slit-like bordered pits where they are in contact with each other. Wood parenchyma paratracheal, sometimes metatracheal and scattered; metatracheal bands irregularly distributed. Pith rays heterogeneous, but mostly of procumbent cells, up to 7 cells wide, 70 cells high; cells with dark reddish substance. No. 12947 B. F.

16) **Dipterocarpus polyspermus** *Blanco** Fig. 1.

Resin ducts present in tangential lines.

Number of pores per square millimeter 3 to 5, oval or elliptic in

* Dipterocarpus polyspermus *Blanco*=Shorea polysperma (*Blanco*) *Merrill*. See Merrill's "Species Blancoanae".

outline, their diameter radially 150 to 300μ; tangentially 100 to 250μ; length of the vessel segments 350 to 600μ. Wood fibers 20 to 25μ in diameter, length 850 to 1,800μ, wall 3 to 4μ thick. Wood parenchyma paratracheal. Pith rays heterogeneous, 1 to 4 cells wide, up to 40 cells high; cells with dark reddish substance. No number.

17) **Dipterocarpus pilosus** *Roxburgh*

A large tree. Resin ducts present.

Number of pores per square millimeter 3 to 5, mostly solitary, oval or elliptic in outline, their diameter radially 200 to 350μ, tangentially 180 to 300μ; length of the vessel segments 450 to 650μ. Tracheids 900 to 1,300μ long. Wood fibers 24 to 28μ in diameter, length 1,700 to 2,00μ, wall 6 to 8μ thick. Wood parenchyma paratracheal metatracheal and scattered; metatracheal bands irregularly distributed, usually one cell wide. Pith rays heterogeneous, uniseriate ray cells upright, polyseriate rays up to 7 cells wide, height indefinitely great; cells with dark reddish substance. No. 1043 T. S.

18) **Dipterocarpus verniciflorus** *Blanco*

Resin ducts present.

Number of pores per square millimeter 3 to 4, usually solitary, oval or round in outline, their diameter 150 to 350μ; length of the vessel segments 550 to 800μ. Tracheids 750 to 1,200μ long. Wood fibers 24 to 28μ in diameter, length 1,400 to 2,000μ, wall 6 to 8μ thick. Wood parenchyma paratracheal, metatracheal and scattered. Pith rays heterogeneous, 1 to 6 cells wide, up to 70 cells high, cells with dark reddish substance. No. 5955 B. F.

19) **Hopea acuminata** *Merrill*

Vertical resin ducts present in tangential lines.

Pores evenly distributed, number per square millimeter 8 to 10, solitary pores round or oval in outline, their diameter 100 to 200μ; length of the vessel segments 400 to 600μ. Wood fibers 16 to 18μ in diameter, length 850 to 1,800μ, wall 3 to 4μ thick. Wood parenchyma paratracheal, more or less metatracheal and scattered. Pith rays homogeneous, 1 to 4 cells wide, up to 90 cells high; cells often with crystals of calcium oxalate. No. 17595 B. F.

20) **Hopea mindanensis** *Foxworthy*

Resin ducts present.

Number of pores per square millimeter 14 to 19, solitary or in groups solitary pores oval or elliptic in outline, their diameter radially 90 to 180μ, tangentially 80 to 150μ; length of the vessel segments 400 to 650μ. Wood fibers 18 to 24μ in diameter, length 1,000 to 1,800μ, wall 4 to 6μ thick. Wood parenchyma paratracheal, metatracheal and scattered; metatracheal bands 1 to 5 cells wide in radial direction; chambered parenchyma cells present in great number, cells with crystals of calcium oxalate. Pith rays homogeneous, up to 4 cells wide, height indefinitely great; cells with dark reddish substance. No. 9376 B. F.

21) **Hopea Pierrei** *Hance*

Number of pores per square millimeter 11 to 20, solitary, sometimes 2 connected, solitary pores round in outline, their diameter 70 to 140μ; length of the vessel segments 250 to 600μ, end walls horizontal or slanting, their perforation simple, side walls 3 to 5μ, common boundary walls of two vessels 5 to 7μ thick. Wood fibers 14 to 16μ in diameter, length 600 to 1,500μ, wall 3μ thick. Wood parenchyma paratracheal, terminal and scattered; paratracheal parenchyma often elongated tangentially and becoming metatracheal bands; chambered parenchyma cells with crystals of calcium oxalate present. Pith rays heterogeneous, 1 to 5 cells wide, uniseriate ray cells upright, polyseriate rays up to 60 cells high, often flanked by upright ray cells. No. 10327 B. F.

22) **Hopea plagata** *Vidal*

Number of pores per square millimeter 16 to 21, solitary or connected, solitary pores oval or elliptic in outline, their diameter 70 to 150μ; length of the vessel segments 300 to 500μ. Wood fibers with small cavities, 14 to 16μ in diameter, length 1,000 to 2,000μ, wall 5 to 8μ thick. Wood parenchyma paratracheal and scattered; the former extending tangentially. Pith rays heterogeneous, 1 to 7 cells wide, up to 80 cells high; large ray cells with crystals of calcium oxalate. No. 6017 B. F.

23) **Isoptera borneensis** *Scheffler*

Number of pores per square millimeter 7 to 12, solitary or connected, solitary pores oval or round in outline, their diameter 120 to 250μ; length of the vessel segments 250 to 450. Wood fibers with small cavities, 15 to 18μ in diameter, length 800 to 1,800μ, wall 4 to 6μ thick. Wood parenchyma

paratracheal, metatracheal and scattered; chambered parenchyma cells with crystals of calcium oxalate present in great number. Pith rays homogeneous, 1 to 4 cells wide, up to 25 cells high; cells plugged with dark reddish substance. No. 9374 B. F.

24) **Pentacme contorta** *Merrill and Rolfe*

A tall tree up to 150 centimeters in diameter.

Pores evenly distributed, number per square millimeter 2 to 4, usually solitary, oval, elliptic or round in outline, their diameter radially 150 to 320μ, tangentially 140 to 280μ; length of the vessel segments 300 to 700μ their perforation simple, side walls 2 to 3μ thick. Wood fibers 25 to 30μ in diameter, length 850 to 1,700μ, wall 3μ thick. Wood parenchyma paratracheal and scattered. Pith rays heterogeneous, 1 to 4 cells wide, up to 40 cells high; cells with dark reddish substance or sometimes with crystals of calcium oxalate. No. 17487 B. F.

25) **Shorea eximia** *Scheffler* Fig. 2.

A tall straight tree up to 150 centimeters in diameter.

Vertical resin ducts present. Pores evenly distributed, number per square millimeter 2 or 3, solitary, sometimes 2 connected, solitary pores oval or elliptic in outline, their diameter radially 200 to 450μ, tangentially 180 to 350μ; length of the vessel segments 400 to 600μ their perforation simple. Wood fibers 20 to 25μ in diameter, length 800 to 1,600μ, wall 3 to 4μ thick. Wood parenchyma paratracheal, sometimes metatracheal and scattered, metatracheal bands irregularly distributed. Pith rays heterogeneous, (nearly all cells procumbent) 1 to 5 cells wide, height indefinitely great; cells plugged with dark reddish substance. No. 17490 B. F.

26) **Shorea** *near* **guiso** *Blanco* * Fig. 3

Number of pores per square millimeter 5 to 8, tyloses present, usually solitary, oval or elliptic in outline, their diameter radially 150 to 300μ, tangentially 120 to 250μ; length of the vessel segments 250 to 600μ. Wood fibers 14 to 16μ in diameter, length 1,000 to 2,000μ, wall 3 to 4μ thick. Wood parenchyma paratracheal, more or less metatracheal and scattered; idioblasts present in fairly great number. Pith rays homogeneous, 1 to 5 cells

* The specimen is identified as *S. guiso* by Mr. L. J. Reyes.—R. K.

wide, up to 80 cells high; cells with dark yellowish substance. Museum Plank No. 107.

27) **Shorea guiso** *Blanco*

A tree up to 180 centimeters or more in diameter.

Number of pores per square millimeter 7 to 11, usually solitary, oval or round in outline, their diameter 80 to 150μ, length of the vessel segments 250 to 450μ. Wood fibers 15 to 18μ in diameter, length 800 to 1,600μ, wall 4μ thick. Wood parenchyma metatracheal, paratracheal and scattered; paratracheal parenchyma often extending winglike and connecting tangentially, metatracheal bands irregularly distributed; chambered parenchyma cells present, with crystals of calcium oxalate. Pith rays heterogeneous, mostly of procumbent cells, up to 5 cells wide and 30 cells high; cells with dark reddish substance. No. 6546 B. F.

28) **Shorea philippinensis** *Brandis*

Number of pores per square millimeter 9 to 12, solitary, sometimes 2 connected; solitary pores oval or elliptic in outline, their diameter radially 100 to 200μ, tangentially 80 to 160μ; length of the vessel segments 250 to 500μ. Wood fibers 14 to 16μ in diameter, length 750 to 1,700μ, wall $3^1/_2\mu$ to $4^1/_2\mu$ thick. Wood parenchyma paratracheal, metatracheal and scattered; paratracheal parenchyma often extending tangentially, idioblasts present. Pith rays heterogeneous, mostly of procumbent cells, up to 5 cells wide, 1 millimeter high. No. 6041 B. F.

29) **Shorea polysperma** *Merrill*

A tree up to 160 centimeters in diameter.

Number of pores per square millimeter 2 to 4, mostly solitary, oval or elliptic in outline, their diameter radially 150 to 250μ, tangentially 120 to 220μ; length of the vessel segments 300 to 450μ. Wood fibers 18 to 22μ in diameter, length 1,000 to 2,00μ, wall 3μ in early wood, in late wood 4 to 7μ thick. Wood parenchyma paratracheal, metatracheal and scattered; paratracheal parenchyma often elongating tangentially; metatracheal bands 1 or 2 cells wide in radial direction and irregularly distributed. Pith rays heterogeneous, 1 to 6 cells wide, up to 70 cells high. No. 6324 B. F.

30) **Shorea mindanaensis** *Foxworthy* *

Vertical resin ducts present.

Number of pores per square millimeter 7 to 10, solitary or connected, their diameter 120 to 250μ; length of the vessel segments 220 to 500μ. Wood fibers 16 to 20μ in diameter, length 800 to 1,600μ, wall 3 to 4μ thick. Wood parenchyma paratracheal and metatracheal. Pith rays heterogeneous, 1 to 4 cells wide, up to 35 cells high. No. 9376 B. F.

31) **Shorea negrosensis** *Foxworthy*

A tall tree up to 200 centimeters in diameter.

Number of pores per square millimeter 2 to 4, solitary or 2 connected, solitary pores oval or elliptic in outline, their diameter radially 250 to 400μ, tangentially 200 to 350μ; length of the vessel segments 450 to 800μ, end walls horizontal or slightly slanting, their perforation simple. Tracheids 600 to 800μ long. Wood fibers 20 to 25μ in diameter, length 1,400 to 2,200μ, wall 3 to 4μ thick. Wood parenchyma paratracheal and scattered. Pith rays nearly homogeneous (marginal cells upright), 1 to 4 cells wids, up to 40 cells high; cells with dark reddish substance. No. 17482 B. F.

32) **Vatica mangachapoi** *Blanco*

A tall tree up to 70 centimeters in diameter.

Pores evenly distributed, number per square millimeter 50 to 60, tyloses present and very conspicuous, usually solitary, round in outline, their diameter 50 to 100μ, length of the vessel segments 350 to 650μ, end walls horizontal or slightly slanting, their perforation simple. Wood fibers with small cavities, 12 to 14μ in diameter, length 900 to 1,850μ, wall 3 to 4μ thick. Wood parenchyma paratracheal, in short metatracheal bands and scattered. Pith rays heterogeneous, 1 to 5 cells wide, up to 50 cells high; large ray cells with crystals of calcium oxalate. No. 9043 B. F.

Malvaceae

33) **Bombycidendron vidalianum** *Merrill and Rolfe.*

Pores evenly distributed, number per square millimeter 11 to 14, solitary sometimes 2 or 3 connected; solitary pores are oval or round in outline, their diameter 80 to 170μ, length of the vessel segments 300 to 400μ, their

* No. 9376 B. F. in the records of the Bureau of Forestry and the Bureau of Science is *Hopea mindanaensis* Foxw., a hard and heavy wood and fine texture. No. 9372B. F. is *Shorea mindanaensis* Foxw., a soft dipterocarp; the only dipterocarp native to the Islands that has horizontal resin ducts. These are minute and only visible under high magnification.—L. J. R.

perforation simple. Wood fibers arranged in horizontal series, 20 to 25μ in diameter, length 950 to 1,800μ, wall 3μ thick. Wood parenchyma paratracheal and scattered. Pith rays heterogeneous, polyseriate rays of procumbent cells arranged in regular horizontal series; 2 or 3-seriate, sometimes 4-seriate, 3 to 10 cells high, always flanked by one or two large upright ray cells which usually contain crystals of calcium oxalate. Museum Plank No. 154.

34) **Camptostemon philippinensis** *Vidal*

A tree of the mangrove swamps up to 100 centimeters in diameter, very rarely reaching such large size.

Pores evenly distributed, usually 2 to 4 connected radially, number per square millimeter 7 to 12; solitary pores are elliptic in outline, their diameter radially 60 to 120μ, length of the vessel segments 350 to 450μ, their perforation simple, side walls 5 to 8μ, common boundary walls of two vessels 6 to 10μ thick; with very many bordered pits where they are in contact with each other, the diameter of border being about 3μ. Wood fibers 20 to 22μ in diameter, length 400 to 900μ, wall 2 to $3^1/_2\mu$ thick. Wood parenchyma paratracheal, metatracheal and scattered; metatracheal bands irregularly distributed. Pith rays heterogeneous, arranged in horizontal series, 1 to 3 fibers distant from each other, uniseriate, 3 to 10 cells high, cells with crystals of calcium oxalate. No. 10259 B. F.

Sterculiaceae

35) **Heritiera littoralis** *Dryander*

A tree up to 90 centimeters in diameter, with a rather short and generally irregular bole. Ripple marks present.

Pores evenly distributed, number per square millimeter 4 to 6, pores plugged with resinous substance, usually solitary, sometimes 2 or more connected, solitary pores are oval or round in outline, their diameter radially 100 to 220μ, tangentially 100 to 200μ; length of the vessel segments 250 to 370μ, end walls horizontal or slanting, their perforation simple. Wood fibers 14 to 16μ in diameter, length 1,300 to 1,900μ, wall 3 to 4μ thick. Wood parenchyma metatracheal, 1 to 4 fibers distant from each other, one cell wide in radial direction, rather irregularly distributed; cells with dark reddish substance. Pith rays more or less arranged in horizontal series, heterogeneous, mostly of procumbent ray cells, 1 to 7 cells wide, up to 40 cells high; cells

with dark reddish substance. No. 5391 B. F.

36) **Pterospermum niveum** *Vidal*

A tree up to 60 centimeters in diameter. Distinct ripple marks on longitudinal section.

Pores evenly distributed, number per square millimeter 8 to 10, solitary or connected, solitary pores oval or round in outline, their diameter 150 to 280μ, end walls horizontal or slightly slanting, their perforation simple; length of the vessel segments 450 to 600μ; with very many bordered pits where they are in contact with each other, the diameter of border being about 6μ. Wood fibers 20 to 25μ in diameter, length 1,000 to 2,000μ, wall 3μ thick. Wood parenchyma metatracheal, paratracheal and scattered, usually "gefasert". Pith rays heterogeneous, in two modifications; upright ray cells large, procumbent ray cells small, both are irregularly combined. No. 2011 M.

37) **Pterocymbium tinctorium** *Merrill*

A tall straight tree, up to 90 centimeters in diameter. Ripple marks on tangential section.

Pores evenly distributed, number per square millimeter 1 or 2, solitary, oval or elliptic in outline, their diameter radially 150 to 300μ, tangentially 120 to 250μ; length of the vessel segments 500 to 600μ, their perforation simple, side walls 3μ thick. Wood fibers arranged in tier-like ranking, sometimes septate, their diameter 25 to 30μ, length 1,000 to 2,300μ, wall $1^1/_2\mu$ to 2μ thick. Wood parenchyma paratracheal, metatracheal and scattered; metatracheal bands one cell wide, irregularly distributed, inconspicuous on cross section. Pith rays heterogeneous, in two modifications, uniseriate and polyseriate; uniseriate ray cells usually upright, polyseriate rays 3 to 10 cells wide, 1 to 3 millimeters high; cells mostly procumbent, but marginal cells large and upright. Museum Plank 158.

38) **Sterculia foetida** *Linnaeus*

A tree up to 100 centimeters in diameter.

Pores evenly distributed, number per square millimeter 3 to 6; usually solitary sometimes 2 connected; solitary pores are oval or elliptic in outline, their diameter radially 100 to 200μ, tangentially 100 to 170; length of the vessel segments 300 to 400μ, their perforation simple; with very many bordered pits where they are in contact with each other, the diameter of

border being about 8μ. Wood fibers and wood parenchyma are the principal elements of the wood; wood fibers 16 to 18μ in diameter, length 900 to 2,000μ, wall 1μ thick; wood parenchyma present in great number, arranged more or less in metatracheal bands. Pith rays heterogeneous, up to 10 cells wide and 2.5 millimeters high; marginal ray cells large and mostly upright. No. 10799 B. F.

39) **Sterculia oblongata** *R. Brown*

A tree up to 70 centimeters in diameter. Ripple marks present.

Number of pores per square millimeter 2 to 5, mostly solitary, their diameter radially 200 to 350μ, tangentially 150 to 300μ; length of the vessel segments 400 to 550μ. Wood fibers 20 to 25μ in diameter, length 2,000 to 3,400μ, wall 2 to 3μ thick. Wood parenchyma paratracheal, metatracheal and scattered. Pith rays heterogeneous, up to 8 cells wide, height indefinitely great. No. 6053 B. F.

40) **Tarrietia javanica** *Blume*

A tree up to 130 centimeters in diameter.

Pores evenly distributed, number per square millimeter 2 to 4, solitary, sometimes 2 or more connected radially, solitary pores are oval or elliptic in outline, their diameter radially 200 to 400μ, tangentially 150 to 300μ; length of the vessel segments 400 to 500μ, end walls horizontal or slanting, their perforation simple, side walls 5 to 8μ, common boundary walls of two vessels 8 to 16μ thick; with very many bordered pits where they are in contact with each other, the diameter of border being 8μ. Wood fibers sometimes septate, 16 to 20μ in diameter, length 900 to 2,300μ, wall 3 to 4μ thick. Wood parenchyma paratracheal, metatracheal (terminal?) and scattered; metatracheal bands irregularly distanced from each other, usually one, sometimes 2 or more cells wide in radial direction. Pith rays heterogeneous, 1 to 7 cells wide, height indefinitely great; cells plugged with dark reddish substance. No. 1383 T. S.

41) **Tarrietia sylvatica** *Merrill*

A tree up to 100 centimeters in diameter; with a generally short and irregular bole. Ripple marks present, especially in tangential section.

Pores plugged with dark reddish substance, solitary or 2 to 4 connected in radial direction; solitary pores are elliptic in outline, their diameter radially

150 to 250μ, tangentially 100 to 220μ; length 1,800 to 2,500μ, wall 4μ thick. Wood parenchyma paratracheal, metatracheal and scattered; metatracheal bands one cell wide in radial direction, rather regularly arranged. Pith rays more or less arranged in horizontal series, heterogeneous, mostly of procumbent ray cells, up to 6 cells wide, height indefinitely great. Museum Pillar No. 6.

Elaeocarpaceae

42) **Elaeocarpus calomala** (*Blanco*) *Merrill*

Pores evenly distributed, number per square millimeter 7 to 9, solitary or in groups, solitary pores are oval or elliptic in outline, their diameter radially 100 to 230μ, tangentially 80 to 180μ; length of the vessel segments 500 to 800μ; with very many bordered pits where they are in contact with each other, the diameter of border being 15 to 17μ. Tracheids 700 to 950μ long. Wood fibers 14 to 18μ in diameter, length 950 to 1,700μ, wall 2 to 3μ in early wood, in late wood 3 to 4μ thick. Wood parenchyma rather scarce and scattered among fibers. Pith rays heterogeneous, in two distinct modifications; uniseriate rays present in great number, cells always upright, polyseriate rays up to 7 cells wide, cells procumbent, up to 60 cells high, flanked by a few upright ray cells. No. 17602 B. F.

43) **Grewia stylocarpa** *Warburgh*

Pores evenly distributed, number per square millimeter 10 to 13; solitary or in groups, in the latter case 2 to 4 connected radially; solitary pores are oval or round in outline, their diameter radially 80 to 160μ, tangentially 80 to 150μ; length of the vessel segments 900 to 1,900μ, their perforation simple, side walls 3 to 4μ, common boundary walls of two vessels 5 to 7μ thick; with very many bordered pits where they are in contact with each other, their diameter being about 3 to 4μ. Wood fibers 25 to 28μ in diameter, length 900 to 1,900μ, wall 3 to $3^1/_2\mu$ thick. Wood parenchyma paratracheal, metatracheal and scattered; metatracheal bands one cell wide in radial direction, rather irregularly distributed. Pith rays heterogeneous; in two modifications: uniseriate rays present in great number, 1 or 2 fibers distant from each other, often 2 rays connecting vertically; polyseriate rays up to 5 cells wide and 2.5 millimeter high; cells with dark reddish substance or often crystals of calcium oxalate. No. 17589 B. F.

Lineae

44) **Reinwardtiodendron Merrillii** *Perkins*

Pores evenly distributed, number per square millimeter 30 to 40, solitary pores are oval or round in outline, their diameter 60 to 130μ, length of the vessel segments 200 to 600μ, end walls horizontal or slanting, their perforation simple; with very many bordered pits where they are in contact with each other, the diameter of border being 2 to 3μ. Wood fibers with small cavities, 10 to 14μ in diameter, length 500 to 1,100μ, wall 3 to 4μ thick. Wood parenchyma metatracheal, 1 to 3 cells wide, arranged in regular tangential lines; very conspicuous on cross section; chambered parenchyma cells present in great number with crystals of calcium oxalate. Pith rays homogeneous, 1 or 2-seriate, up to 20 cells high. No. 1891 T. S.

Rutaceae

45) **Murraya exotica** *Linnaeus*

A small tree up to 25 centimeters in diameter, with a short and generally very irregular bole.

Pores evenly distributed, number per square millimeter 20 to 25, solitary pores are oval or elliptic in outline, their diameter radially 50 to 100μ, tangentially 40 to 70μ; length of the vessel segments 220 to 350μ, end walls slanting, their perforation simple. Wood fibers 8 to 14μ in diameter, length 450 to 1,000μ, wall 3 to 4 thick. Wood parenchyma paratracheal, metatracheal and scattered; paratracheal parenchyma 1 or 2 cells wide, metatracheal bands 1 to 5 cells wide in radial direction, widely distanced from each other; chambered parenchyma cells present in great number, with crystals of calcium oxalate. Pith rays homogeneous, 1 or 2 cells wide, up to 20 cells high. No. 2041 T. S.

Simarubaceae

46) **Ailanthus philippinensis** *Merrill*

Pores evenly distributed, number per square millimeter 2 or 3; solitary or 2 to 3 connected; solitary pores are round in outline, their diameter 150 to 300μ, length of the vessel segments 400 to 800μ, their perforation simple, side walls 3 to 5μ, common boundary walls of two vessels 5 to 8μ thick; with very many bordered pits where they are in contact with each other, the bordered pits angular in outline, their diameter 6 to 7μ. Wood fibers arranged

in radial direction, their radial diameter 16 to 40μ, length 700 to 1,900μ, wall 3 to $4^1/_2\,\mu$ thick. Wood parenchyma metatracheal, paratracheal and scattered; metatracheal bands 1 to 4 cells wide, irregularly distributed. Pith rays heterogeneous, 3 to 10 fibers distant from each other, 1 to 5 cells wide, up to 40 cells high. No. 22337 B. F.

Burseraceae

47) **Canarium ahernianum** *Merrill*

Number of pores per square millimeter 5 to 9, solitary or 2 or more connected; solitary pores are round in outline, their diameter 120 to 250μ, length of the vessel segments 250 to 600μ, their perforations simple. Wood fibers septate, 24 to 28μ in diameter, length 850 to 1,500μ, wall 3μ thick. Wood parenchyma paratracheal and scattered. Pith rays heterogeneous, 1 to 4 cells wide, up to 15 cells high. No. 17516 B. F.

48) **Canarium calophyllum** *Perkins*

Pores evenly distributed, number per square millimeter 5 to 10, solitary, sometimes 2 or more connected, solitary pores are oval or elliptic in outline, their diameter radially 100 to 200μ, tangentially 90 to 180μ; length of the vessel segments 450 to 800μ. Wood fibers always septate, 20 to 30μ in diameter, length 800 to 1,600μ, wall 3 to 4μ thick. Wood parenchyma paratracheal aud scattered; paratracheal parenchyma one cell wide. Pith rays heterogeneous, 1 or 2 sometimes 3 cells wide, 3 to 17 cells high. No. 12969 B.F.

49) **Canarium radlkoferi** *Perkins*

Number of pores per square millimeter 6 to 7, solitary or 2 to 4 connected, solitary pores are round or oval in outline, their diameter 120 to 220μ; length of the vessel segments 400 to 700μ. Wood fibers septate, 25 to 32μ in diameter, length 750 to 1,500μ, wall 3μ thick. Wood parenchyma paratracheal and scattered; paratracheal parenchyma one or two cells wide. Pith rays heterogeneous, 1 or 2-seriate, up to 18 cells high. No. 17592 B. F.

50) **Canarium villosum** *F. Villar*

The largest and most widely distributed species of the genus in the Philippines. A tree up to 100 centimeters or over in diameter.

Number of pores per square millimeter 13 to 14, solitary or 2 or more connected radially, round in outline, their diameter 100 to 200μ; length of the vessel segments 350 to 550μ. Wood fibers septate, 20 to 25μ in diametr,

length 600 to 1,200μ, wall 2 to 3μ thick. Pith rays heterogeneous, 1 to 3 cells wide, up to 30 cells high. No. 8108 B. F.

51) **Canarium ovatum** *Engler*

Number of pores per square millimeter 14 to 17; solitary or 2 to 4 connected mostly in radial direction; solitary pores are round in outline, their diameter 70 to 150μ; length of the vessel segments 200 to 300μ; with very many bordered pits where they are in contact with each other, the diameter of border being about 10μ. Wood fibers septate, 20 to 24μ in diameter, length 500 to 1,400μ, wall 2 to 3μ thick. Wood parenchyma paratracheal and scattered. Pith rays heterogeneous, 1 to 4 cells wide, up to 20 cells high; horizontal resin canals present, surrounded by many small cells. No. 2010 M.

52) **Santiria nitida** *Morrill*

A medium-sized tree up to 60 centimeters in diameter, straight and moderately tall.

Pores evenly distributed, number per square millimeter 12 to 17, tyloses present, mostly solitary, oval or elliptic in outline, their diameter radially 100 to 200μ, tangentially 80 to 180μ; length of the vessel segments 250 to 400μ, their perforation simple. Wood fibers septate, 16 to 18μ in diameter, length 700 to 1,200μ, wall 3μ thick. Wood parenchyma paratracheal and scattered. Pith rays heterogeneous; horizontal resin ducts present; 1 or 2 cells wide, up to 25 cells high; procumbent cells with dark reddish substance, upright cells often with crystals of calcium oxalate. Museum Plank 128.

Meliaceae

53) **Aglaia Clarkii** *Merrill*

A tree up to 85 centimeters in diameter.

Pores evenly distributed, number per square millimeter 12 to 16, solitary or 2 to 4 connected radially, solitary pores are oval or elliptic in outline, their diameter radially 100 to 200μ, tangentially 80 to 170μ, length of the vessel segments 400 to 600μ, end walls horizontal or slanting, their perforation simple; with very many bordered pits where they are in contact with each other, the diameter of border 3 to 4μ. Wood fibers septate, arranged radially, 18 to 22μ in diameter, length 900 to 1,900μ, wall 3 to 4μ thick. Wood parenchyma paratracheal, sometimes terminal, and scattered; paratracheal parenchyma often spreading winglike and connected tangentially, chambered

parenchyma cells present in great number with crystals of calcium oxalate. Pith rays homogeneous, 1 or 2-seriate, 3 to 20 cells high, cells with dark reddish substance. No. 6072 B. F.

54) **Dysoxylum turczaninowii** *C. de Candolle*

A tree up to 80 centimeters in diameter.

Pores evenly distributed, number per square millimeter 57 to 72, mostly connected in radial direction, their diameter radially 70 to 150μ, tangentially 60 to 120μ; length of the vessel segments 450 to 700μ, end walls horizontal or slanting, their perforations simple; with very many bordered pits where they are in contact with each other, the diameter of border being about 3 to 4μ. Wood fibers 15 to 18μ in diameter, length 800 to 1,800μ, wall 4 to 5μ thick. Wood parenchyma metatracheal (terminal?); chambered parenchyma cells with crystals present in great number. Pith rays nearly homogeneous, 1 or 2 rarely, 3 cells wide, 15 to 20 cells high. No. 1394 T. S.

55) **Chisocheton philippinus** *Harms.* *

Pores evenly distributed, number per square millimeter 4 to 7, solitary, sometimes connected; solitary pores are round or oval in outline, their diameter 100 to 200μ; length of the vessel segments 450 to 1,000μ, end walls horizontal or slanting, their perforation simple. Wood fibers septate, 15 to 18μ in diameter, length 850 to 2,000μ, wall 4μ thick. Wood parenchyma metatracheal, 3 to 9 fibers distant from each other, 1 to 4 cells wide in radial direction, arranged in regular tangential lines. Pith rays heterogeneous, 1 to 3 cells wide, 5 to 20 cells high. No. 5765 B. F.

56) **Amoora Aherniana** *Merrill*

A tall straight tree up to 110 centimeters in diameter.

Pores evenly distributed, number per square millimeter 3 or 4, often plugged with dark reddish substance, their diameter 200 to 400μ, length of the vessel segments 400 to 500μ, their perforation simple. Wood fibers with reddish substance in cavities, 20 to 25μ in diameter, length 1,200 to 2,000μ, wall 4 to 5μ thick. Wood parenchyma paratracheal and scattered. Pith rays heterogeneous, 1 to 4 cells wide, up to 25 cells high, cells with dark reddish substance. No. 7360 B. F.

* *Chisocheton philippinus* Harms. has been reduced by Merrill to *Chisocheton pentandrus* (Blanco) Merrill.—See "Species Blancoanae" by Merrill pp. 210-211.—L. J. R.

57) **Melia Candollei** *Jussieu*

Pores evenly distributed, number per square millimeter 4 to 6, solitary, sometimes 2 or more connected; solitary pores are oval or round in outline, their diameter radially 120 to 300μ, tangentially 120 to 250μ; length of the vessel segments 200 to 450μ, their perforation simple; the inner surface of the wall of small vessels with spiral thickenings; with very many bordered pits where they are in contact with each other, the bordered pits angular in outline, their diameter about 7μ. Wood fibers arranged in radial direction, their diameter 20 to 25μ length 600 to 1,100μ, wall 2μ thick. Wood parenchyma paratracheal and scattered; chambered parenchyma cells present, with crystals of calcium oxalate. Pith rays nearly homogeneous, 1 to 5 cells wide, up to 35 cells high. No. 7119 B. F.

58) **Toona calantas** *Merrill and Rolfe*

A tree up to 150 centimeters in diameter.

Pores evenly distributed, number per square millimeter 3 to 5, mostly solitary, often plugged with reddish substance, their diameter 150 to 300μ; length of the vessel segments 400 to 600μ, end walls horizontal or slanting, their perforation simple; with very many bordered pits where they are in contact with each other, the bordered pits being about 7μ in diameter; wall of vessels sometimes with striations. Wood fibers 20 to 25μ in diameter, length 800 to 1,800μ, wall 3 to 4μ thick. Wood parenchyma paratracheal and metatracheal, the latter variably distanced from each other. Pith rays homogeneous, 1 or 2, sometimes 3 cells wide. Museum Plank 42.

59) **Sandoricum indicum** *Cavanilles*

A tree up to 70 centimeters in diameter.

Pores evenly distributed, number per square millimeter 4 to 11 usually solitary, sometimes 2 or more connected, solitary pores are oval or round in outline, their diameter 150 to 250μ; length of the vessel segments 350 to 650μ, their perforation simple; with very many bordered pits where they are in contact with each other, the bordered pits being arranged like the cells of a honey comb with a diameter of about 3 to 4μ. Wood fibers 20 to 30μ, in diameter, length 700 to 1,500μ, wall 2 to 3μ thick. Wood parenchyma paratracheal, metatracheal and scattered; paratracheal parenchyma one cell wide; metatracheal bands variably distanced from each other, 1 to 3 cells wide in

radial direction. Pith rays heterogeneous, 2 to 5 fibers distant from each other, 1 to 3 cells wide; uniseriate ray cells large and upright; polyseriate rays 5 to 30 cells high, always flanked by upright ray cells. No. 1461 T. S.

60) **Sandoricum Vidalii** *Merrill* Fig. 5

A tree up to 90 centimeters in diameter. Wood practically identical with *Sandoricum indicum.*

Number of pores per square millimeter 4 to 6, usually solitary; they are oval or round in outline, their diameter 100 to 220μ; length of the vessel segments 450 to 750μ. Wood fibers 22 to 32μ in diameter, length 950 to 1,700μ, wall 2μ thick. Wood parenchyma paratracheal, metatracheal and scattered; metatracheal bands usually discontinuous. Pith rays heterogeneous, 1 to 4 cells wide; polyseriate rays always flanked by upright ray cells. No. 17593 B. F.

61) **Xylocarpus moluccensis** (*Lamarck*) *M. Roemer*

A tree of the mangrove swamps up to 65 centimeters in diameter.

Pores evenly distributed, often plugged with dark reddish substance, number per square millimeter 19 to 26, mostly solitary, round in outline, their diameter 70 to 120μ, length of the vessel segments 200 to 400μ, end walls horizontal or slanting, their perforation simple. Wood fibers 16 to 18μ in diameter, length 500 to 1,200μ, wall 3 to 4μ thick; cavities plugged with dark reddish substance. Wood parenchyma metatracheal and scattered; chambered parenchyma cells present, with crystals of calcium oxalate. Pith rays heterogeneous, 2 to 5 cells wide, up to 15 cells high, upright cells with crystals af calcium oxalate. No. 110 B. F.

62) **Xylocarpus granatum** *Koenig* Fig. 7

Ripple marks present.

Number of pores per square millimeter 10 to 16, often deposited with reddish substance, solitary sometimes 2 connected, solitary pores are round or oval in outline, their diameter 50 to 100μ, length of the vessel segments 350 to 450μ, end walls slanting, their perforation simple. Wood fibers always septate, 16 to 18μ in diameter, length 500 to 1,100μ, wall 3μ thick. Wood parenchyma paratracheal and scattered; paratracheal mostly one cells wide. Pith rays heterogeneous, arranged in horizontal series, 2 to 5 fibers distant from each other, 1 to 4 cells wide, 3 to 15 cells high. No. 13136 B. S.

Olacinaceae

63) **Strombosia philippinensis** *Rolfe*

A medium-sized tree up to 50 centimeters in diameter.

Pores arranged in radial direction, number per square millimeter 40 to 55, tyloses conspicuous, mostly connected in radial direction, solitary pores are oval or elliptic in outline, their diameter radially 50 to 100μ, tangentially 50 to 80μ; length of the vessel segments 1,000 to 1,800μ, their perforation scalariform, cross bars 5 to 13. Wood fibers with small cavities, 20 to 25μ in diameter, length 2,000 to 3,500μ, wall 8 to 12μ thick. Wood parenchyma metatracheal and scattered; metatracheal bands one cell wide in radial direction. Pith rays heterogeneous, 1 to 5 cells wide, up to 50 cells high, polyseriate rays usually flanked by upright uniseriate ray cells, cells plugged with dark reddish substance, upright cells often with crystals of calcium oxalate. No. 2078 T. S.

Icacinaceae

64) **Urandra luzoniensis** *Merrill*

Pores evenly distributed, number per square millimeter 10 to 13, mostly solitary, oval or elliptic, somewhat polygonal in outline, their diameter 80 to 150μ; length of the vessel segments 700 1,400μ, end walls slanting, their perforation simple, rarely scalariform, cross bars then very many; with very many bordered pits where they are in contact with each other, the aperture horizontally opened. Tracheid-fibers 35 to 45μ in diameter, length 2,500 to 3,700μ, wall 8 to 12μ thick. Wood parenchyma metatracheal and scattered; metatracheal bands 1 to 3 fibers distant from each other, one cell wide in radial direction. Pith rays heterogeneous, up to 12 cells wide, height indefinitely great. No. 17539 B. F.

Rhamnaceae

65) **Zizyphus talanai** (*Blanco*) *Merrill*

A tree up to 120 centimeters in diameter.

Pores evenly distributed, number per square millimeter 4 to 6, solitary or 2 to 4 connected in radial direction, their diameter radially 100 to 220μ, tangentially 90 to 180μ; length of the vessel segments 450 to 900μ, their perforation simple. Wood fibers arranged in radial direction, their diameter 18 to 20μ, length 600 to 1,400μ, wall 2 to 3μ thick. Wood parenchyma metatracheal, paratracheal and scattered; metatracheal bands 3 to 8 cells

wide in radial direction. Pith rays nearly homogeneous, 1 to 3 fibers distant from each other, uniseriate, up to 30 cells high; cells often with crystals of calcium oxalate. No. 17528 B. F.

Sapindaceae

66) **Pometia pinnata** *Forster*

A moderately tall, straight tree up to 100 centimeter.

Pores evenly distributed, number per square millimeter 3 to 6, solitary, sometimes 2 or more connected radially, solitary pores are round in outline, their diameter 150 to 300μ; length of the vessel segments 300 to 700μ, end walls horizontal or slightly slanting, their perforation simple; with very many bordered pits where they are in contact with each other, the diameter of border 3 to 6μ. Wood fibers arranged in radial direction, 20 to 25μ in diameter, length 600 to 1,200μ, wall 3 to 4μ thick. Wood parenchyma paratracheal, metatracheal (terminal ?) and scattered; paratracheal parenchyma 2 to 4 cells wide; metatracheal bands very many fibers distant from each other, 2 to 7 cells wide in radial direction. Pith rays nearly homogeneous, 1 to 3 fibers distant from each other, uniseriate, sometimes biseriate partly, up to 20 cells high, cells often with crystals of calcium oxalate. No. 15059 B. F.

67) **Litchi philippinensis** *Radlkofere*

A tree up to 90 centimeters in diameter.

Pores evenly distributed, number per square millimeter 12 to 14, mostly solitary, their diameter radially 100 to 180μ, tangentially 80 to 150μ, length of the vessel segments 350 to 700μ, their perforation simple. Wood fibers plugged with dark reddish substance, 16 to 20μ in diameter, length 650 to 1,400μ, wall 4 to 6μ thick. Wood parenchyma paratracheal and scattered. Pith rays nearly homogeneous, mostly uniseriate, rarely 2 or 3-seriate in part, up to 25 cells high, 2 rays often connecting vertically. Museum Plank 170.

Anacardiaceae

68) **Dracontomelum edule** (*Blanco*) *Skeels*

A tall, straight tree up to 60 centimeters or more in diameter.

Pores evenly distributed, number per square millimeter 6 to 9, solitary or connected, solitary pores are round in outline, their diameter 100 to 220μ; length of the vessel segments 400 to 700μ, end walls horizontal or slightly slanting, their perforation simple. Wood fibers always septate, their walls

very conspicuous in longitudinal section, 20 to 30μ in diameter, length 600 to 1,700μ, wall 3 to 4μ thick. Wood parenchyma paratracheal and scattered. Pith rays heterogeneous, mostly of procumbent cells, 1 to 3 cells wide, up to 12 cells high, cells with dark reddish substance; large horizontal resin ducts present in pith rays. Museum Plank 115.

69) **Dracontomelum Dao** *Merrill and Rolfe*

A tall tree up to 100 centimeters in diameter.

Number of pores per square millimeter 2 to 3, solitary, sometimes connected, solitary pores are oval or round in outline, their diameter radially 150 to 280μ, tangentially 120 to 250μ, length of the vessel segments 300 to 700μ. Wood fibers arranged radially, always septate, 15 to 20μ in diameter, length 700 to 1,550μ, wall 3 to 4μ. Wood parenchyma paratracheal and scattered. Pith rays 1 to 6 fibers distant from each other, 1 to 3 cells wide, uniseriate ray cells upright, polyseriate rays up to 25 cells high, usually flanked by upright ray cells. Museum Plank 147.

70) **Spondias pinnata** *Kurz* Fig. 6

Pores evenly distributed, number per square millimeter 4 to 8, usually solitary, sometimes 2 or more connected radially, tangentially or in circular groups; solitary pores are round in outline, their diameter 150 to 330μ; length of the vessel segments 520 to 800μ, end walls horizontal or slanting, their perforation simple, side walls 2 to 3μ thick; with very many bordered pits, with horizontal slit-like aperture, where they are in contact with each other, the diameter of border being about 12 to 15μ. Wood fibers septate, 30 to 40μ in diameter, length 800 to 1,900μ, wall 2 to 3μ thick. Wood parenchyma paratracheal and scattered. Pith rays heterogeneous, mostly of procumbent cells, 1 to 6 cells wide; horizontal resin ducts present in rays. No. 17554 B. F.

71) **Mangifera altissima** *Blanco*

A tall tree up to 80 centimeters in diameter.

Pores evenly distributed, number per square millimeter 3 to 5, solitary, sometimes 2 or more connected, mostly in radial direction, solitary pores are round in outline, their diameter 100 to 200μ; length of the vessel segments 450 to 750μ, their perforation simple. Wood fibers 20 to 25μ in diameter, length 750 to 1,300μ, wall 1 to 2μ thick. Wood parenchyma paratracheal,

metatracheal and scattered among fibers; metatracheal bands variably distanced from each other, 1 to 5 cells wide in radial direction. Pith rays heterogeneous, 1 to 5 fibers distant from each other, uniseriate rarely biseriate, 3 to 20 cells high; cells with crystals of calcium oxalate or brown substance. No. 6044 B. F.

72) **Koordersiodendron pinnatum** *Merrill*

A tall straight tree up to 100 centimeters in diameter.

Pores evenly distributed, number per square millimeter 6 to 8, solitary or connected radially, solitary pores are oval or elliptic in outline, their diameter radially 150 to 250μ, tangentially 100 to 200μ, their perforation simple. Wood fibers always septate, 18 to 20μ in diameter, length 1,000 to to 1,800μ, wall 3 to 4μ thick. Wood parenchyma paratracheal and scattered. Pith rays heterogeneous; horizontal resin ducts present; 1 to 2 cells wide, cells with dark reddish substance and sometimes with crystals of calcium oxalate. No. 17551 B. F.

73) **Buchanania! arborescens** *Blume* *

A medium sized tree.

Pores evenly distributed, number per square millimeter 4 to 6, solitary or connected, their diameter 120 to 220μ. Wood fibers 20 to 25μ in diameter, length 900 to 1,500μ, wall $3^1/_2$ to 4μ thick. Wood parenchyma paratracheal and scattered. Pith rays heterogeneous, horizontal resin ducts present; 1 to 3 cells wide, up to 20 cells high, cells often with crystals of calcium oxalate. Museum Plank 23.

Leguminosae

74) **Adenanthera intermedia** *Merrill*

A tree up to 70 centimeters in diameter with a straight and fairly long bole.

Pores evenly distributed, number per square millimeter 6 to 9, solitary sometimes connected, solitary pores are oval or round in outline, their diameter 100 to 200μ, length of the vessel segments 200 to 450μ, with very many bordered pits where they are in contact with each other, the bordered pits being angular in outline, their diameter about 8μ. Wood fibers 15 to 20μ

* All species of this genus are very similar in gross characters, as well as in the cross section as seen under the hand-lens.

in diameter, length 500 to 1,200μ, wall 4μ thick, their cavities plugged with dark reddish substance. Wood parenchyma paratracheal and scattered; paratracheal often spreading wing-like in tangential direction and connected each other, cells plugged with dark reddish substance; chambered parenchyma cells present in fairly great number, with crystals of calcium oxalate. Pith rays homogeneous, 1 to 3 cells wide, 3 to 16 cells high. No. 1771 T. S.

75) **Albizzia acle** (*Blanco*) *Merrill*

A tree up to 125 centimeters or more in diameter, bole short and often crooked.

Pores evenly distributed; number per square millimeter 2 or 3, pores often plugged with dark reddish substance, usually solitary sometimes 2 connected; solitary pores are round in outline, their diameter 150 to 300μ, length of the vessel segments 250 to 400μ, end walls horizontal or slanting, their perforation simple. Wood fibers septate, 20 to 25μ in diameter, often with dark reddish substance in cavities, length 700 to 1,300μ, wall 4μ thickl Wood parenchyma paratracheal, metatracheal and scattered; paratrachea. parenchyma conspicuous on cross section, 3 to 10 cells wide, often spreading wing-like in tangential lines. Pith rays homogeneous, 1 to 4 cells wide, up to 15 cells high; cells plugged with gummy substance. Museum Plank 104.

76) **Albizzia marginata** *Merrill*

A tree up to 60 centimeters in diameter; straight and moderately tall.

Number of pores per square millimeter 1 or 2; solitary or 2 or more connected, oval, elliptic or round in outline, their diameter radially 150 to 300μ, tangentially 140 to 280μ, length of the vessel segments 200 to 300μ. Wood fibers more or less in tier-like arrangement, their diameter 19 to 25μ, in late wood, in early wood 25 to 30μ, length 500 to 1,400μ, wall 2 to 3μ in late wood, in early wood 1 to 2μ thick. Wood parenchyma paratracheal and scattered. Pith rays homogeneous, 1 or 2 cells wide, up to 25 cells high. No. 17603 B. F.

77) **Albizzia procera** *Bentham*

A tree up to 90 centimeters in diameter, straight but not tall.

Number of pores per square millimeter 2 to 4, sometimes plugged with reddish substance, usually solitary sometimes 2 or more connected, solitary pores are round in outline, their diameter 120 to 250μ, length of the vessel

segments 200 to 400μ, end walls horizontal or slanting, their perforation simple. Wood fibers 20 to 25μ in diameter, length 600 to 1,300μ, wall 2 to 3μ thick. Wood parenchyma paratracheal and scattered; in the former case rather conspicuous, often elongating tangentially. Pith rays homogeneous, 1 to 4, mostly 2 or 3 cells wide, 3 to 25 cells high. No. 6022 B. F.

78) **Cassia javanica** *Linnaeus*

Pores evenly distributed; number of pores per square millimeter 2 or 3; sometimes plugged with dark reddish substance, usually solitary sometimes connected, solitary pores are oval or round in outline, their diameter 120 to 250μ, length of the vessel segments 200 to 350μ, end walls horizontal or slightly slanting, their perforation simple. Wood fibers 14 to 16μ in diametr, length 600 to 1,200μ, wall 3μ thick. Wood parenchyma paratracheal, very conspicuous on cross section, usually spreading wing-like tangentially. Pith rays homogeneous, 1 to 3, mostly 2-seriate, 5 to 13 cells high. No. 15032 B. F.

79) **Dalbergia mimosella** *Koorders*

Ripple marks present.

Pores evenly distributed, number per square millimeter 2 to 4, solitary or 2 to 4 connected radially, solitary pores are round in outline, their diameter 150 to 250μ, length of the vessel segments 150 to 270μ, their perforation simple. Wood fibers in tier-like arrangement, 14 to 18μ in diameter, length 600 to 1,400μ, wall 2μ thick. Wood parenchyma paratracheal, metatracheal and scattered; metatracheal bands 1 to 3 cells wide in radial direction; chambered parenchyma cells present with crystals of calcium oxalate. Pith rays homogeneous, arranged in horizontal series, 1 or 2 cells wide, 3 to 10 cells high. No. 5775 B. F.

80) **Samanea saman** (*Jacquin*) *Merrill*

Pores evenly distributed, number per square millimeter 1 to 3, usually solitary, oval or elliptic in outline, their diameter radially 120 to 250μ, tangentially 90 to 180μ, length of the vessel segments 150 to 200μ, their perforation simple. Wood fibers septate, 14 to 16μ in diameter, length 700 to 1,300μ, wall 2μ thick. Wood parenchyma paratracheal, conspicuous on cross section; chambered parenchyma cells present, sometimes with crystals of calcium oxalate. Pith rays homogeneous, 2 sometimes 3 cells wide, 5 to 20

cells high. No. 10793 B. F.

81) **Pithecolobium! scutiferum** (*Blanco*) *Bentham?*

Number of pores per square millimeter 4 to 8, usually solitary, sometimes 2 or more connected, solitary pores are round or oval in outline, their diameter 130 to 250μ, length of the vessel segments 400 to 500μ; with very many bordered pits where they are in contact with each other, the bordered pits angular in outline, their diameter 7 to 8μ. Wood fibers 22 to 25μ in diameter, length 700 to 1,300μ, wall $2^1/_2$ to 3μ thick. Wood parenchyma paratracheal and scattered, in the latter case often few cells connected; chambered parenchyma cells present in great number with crystals of calcium oxalate. Pith rays homogeneous, uniseriate, 3 to 20 cells high. No. 1681 T. S.

82) **Erythrophloeum densiflorum** (*Elmer*) *Merrill*

A tree up to 95 centimeters in diameter, straight but not tall.

Pores evenly distributed, number per square millimeter 2 to 4, solitary or 2 to 4 connected, mostly in radial direction, solitary pores are oval or elliptic in outline, their diameter radially 200 to 380μ, tangentially 150 to 300μ, length of the vessel segments 300 to 550μ, end walls horizontal or slanting, their perforation simple; with very many bordered pits where they are in contact with each other, the bordered pits being angular in outline, their diameter about 7 to 8μ. Wood fibers 18 to 22μ in diameter, length 1,200 to 2,000μ, wall 4 to 5μ thick. Wood parenchyma paratracheal and scattered; paratracheal parenchyma very conspicuous, 5 to 10 cells wide, often spreading wing-like tangentially and becoming metatracheal parenchyma; idioblasts present. Pith rays homogeneous, 1 to 3 cells wide, up to 25 cells high. Museum Plank 131.

83) **Kingiodendron alternifolium** *Merrill*

A tall straight tree up to 100 centimeters or more in diameter.

Pores evenly distributed, number per square millimeter 4 to 6, solitary or in groups, solitary pores are oval or elliptic in outline, their diameter radially 100 to 200μ, tangentially 80 to 160μ, length of the vessel segments 200 to 500μ, their perforation simple; with very many bordered pits where they are in contact with each other, the diameter of border being about 6 to 7μ. Wood fibers 20 to 25μ in diameter, length 900 to 1,900μ, wall 3 to 4μ thick. Wood parenchyma paratracheal, metatracheal and scattered; meta-

tracheal bands 3 to 6 cells wide in radial direction. Pith rays heterogeneous, 1 to 3 cells wide, up to 25 cells high. No. 2761 M.

84) **Indigofera Zollingeri** *Miquel*

Pores evenly distributed, number per square millimeter 8 to 12, solitary sometimes 2 or more connected radially, solitary pores are oval or elliptic in outline, their diameter radially 100 to 200μ, tangentially 90 to 180μ, length of the vessel segments 180 to 250μ, end walls horizontal or slightly slanting, their perforation simple; with very many bordered pits where they are in contact with each other, the diameter of border being 8μ. Wood fibers 14 to 16μ in diameter, length 550 to 1,200μ, wall 2 to 3μ thick. Wood parenchyma paratracheal and scattered. Pith rays nearly homogeneous, 1 to 5 cells wide, 3 to 20 cells high. No. 17605 B. F.

85) **Pahudia rhomboidea** (*Blanco*) *Prain*

A tree up to 120 centimeters in diameter, straight but not tall.

Pores evenly distributed, number per square millimeter 3 or 4, mostly solitary, their diameter radially 150 to 250μ, tangentially 120 to 220μ, length of the vessel segments 250 to 350μ. Wood fibers 20 to 25μ in diameter, length 800 to 1,750μ, wall 4 to 5μ thick. Wood parenchyma paratracheal, metatracheal and scattered; paratracheal parenchyma often elongating tangentially; chambered parenchyma cells present with crystals of calcium oxalate. Pith rays homogeneous, 1 to 3 cells wide, up to 20 cells high. Museum Plank 2.

86) **Parkia timoriana** (*de Candolle*) *Merrrill*

A tall straight tree up to 180 centimeter in diameter.

Pores evenly distributed, number per square millimeter 1 to 3, solitary or 2 to 4 connected; solitary pores are round in outline, their diameter 150 to 300μ, length of the vessel segments 300 to 650μ, their perforation simple; with very many bordered pits where they are in contact with each other, the bordered pits angular in outline, their diameter about 11 to 12μ. Wood fibers 20 to 30μ in diameter, length 800 to 1,600μ, wall 3μ thick. Wood parenchyma paratracheal often elongating tangentially, rather conspicuous on cross section; chambered parenchyma cells present in great number with crystals of calcium oxalate. Pith rays homogeneous, 1 to 4 cells wide, up to 20 cells high; cells often with dark reddish substance. No. 17533 B. F.

87) **Erythrina indica** *Lamarck*

Ripple marks present.

Pores evenly distributed, number per square millimeter 1 or 2; solitary or 2 connected; solitary pores are oval or round in outline, their diameter radially 200 to 450μ, tangentially 120 to 300μ, length of the vessel segments 180 to 300μ, their perforation simple. Wood fibers scarce, arranged in tangential lines, 20 to 26μ in diameter, length 1,000 to 2,000μ, wall 2 to 3μ thick. Wood parenchyma are the principal elements of the wood, cells arranged in horizontal series. Pith rays heterogeneous, up to 9 cells wide, 1.5 millimeters high. No. 1639 T. S.

88) **Pterocarpus indicus** *Willdenow*

Tree up to 20 centimeters in diameter, generally with short and often crooked bole. Ripple marks present.

Pores evenly distributed, number per square millimeter 2 to 5, solitary or connected radially, solitary pores are round in outline, their diameter up to 320μ, length of the vessel segments 250 to 400μ, end walls horizontal or slightly slanting, their perforation simple. Wood fibers swelled at middle, 14 to 16μ in diameter, length 1,000 to 2,000μ, wall 2 to 3μ in early wood, in late wood 3 to 4μ thick. Wood parenchyma paratracheal metatracheal and scattered; chambered parenchyma cells present, with crystals of calcium oxalate. Pith rays in tier-like arrangement, homogeneous, uniseriate, 2 to 8 cells high. No. 12273 B. F.

89) **Pterocarpus echinatus** *Persoon*

Ripple marks conspicuous.

Number of pores per square millimeter 2 to 4, solitary or 2 to 4 connected, solitary pores are oval or round in outline, their diameter 150 to 330μ, length of the vessel segments 200 to 300μ; with very many bordered pits where they are in contact with each other, the diameter of border being about 8 to 9μ. Wood fibers 20 to 25μ in diameter, length 1,000 to 1,800μ, wall 3 to 4μ thick. Wood parenchyma in horizontal series, end cells dome-shaped; paratracheal, metatracheal and scattered; metatracheal bands 1 to 5 cells wide in radial direction, regularly arranged; chambered parenchyma cells present, with crystals of calcium oxalate. Pith rays homogeneous, arranged in horizontal series, rather equally distanced from each other, uniseriate, rarely

biseriate in part, 8 to 12 cells high. No. 6067 B. F.

90) **Sindora supa** *Merrill*

A straight moderately tall tree up to 180 centimeters in diameter.

Pores evenly distributed, number per square millimeter 2 to 4 sometimes plugged with reddish substance, mostly solitary, round in outline, their diameter 60 to 120μ, length of the vessel segments 200 to 500μ, end walls horizontal or slanting, their perforation simple. Wood fibers 16 to 20μ in diameter, length 750 to 1,400μ, wall 4μ thick. Wood parenchyma metatracheal (terminal?), paratracheal and scattered. Pith rays homogeneous, 1 to 4 cells wide, up to 30 cells high. No. 2041 T. S.

91) **Wallaceodendron celebicum** *Koorders* Fig. 8

A tree up to 150 centimeters in diameter, bole short and often crooked.

Pores evenly distributed, number per square millimeter 3 or 4, solitary sometimes 2 or 3 connected, solitary pores are round in outline, their diameter 140 to 280μ, length of the vessel segments 300 to 650μ, end walls slightly slanting, their perforation simple, side walls 4 to 10μ, common boundary walls of two vessels 8 to 14μ thick; with very many bordered pits where they are in contact with each other, the bordered pits being angular by mutual contact, diameter of border 6 to 7μ. Wood fibers septate, 14 to 18μ in diameter, length 800 to 1,500μ, wall 3μ thick. Wood parenchyma paratracheal and scattered, the latter with chambered parenchyma cells which contains crystals of calcium oxalate. Pith rays homogeneous, uniseriate sometimes biseriate in part, 3 to 20 cells high. Museum Plank 86.

Rosaceae

92) **Parinarium corymbosum** (*Blume*) *Miquel*

Pores evenly distributed, number per square millimeter 2 or 3, oval or elliptic in outline, their diameter radially 200 to 400μ, tangentially 150 to 300μ, length of the vessel segments 600 to 1,200μ. Wood fibers with small cavities, 18 to 22μ in diameter, length 1,200 to 2,000μ, wall 6 to 8μ thick; with very many slit-like bordered pits where they are in contact with each other, pits being almost vertical. Wood parenchyma metatracheal, 1 or 2 cells wide, in regular tangential lines. Pith rays nearly homogeneous, 1 or 2 cells wide, up to 25 cells high, cells with crystals of calcium oxalate. No. 22508 B. F.

93) **Pygeum Preslii** *Merrill*

A tree up to 60 centimeters in diameter.

Vertical resin ducts occur in tangential lines by consequence of injury. Pores evenly distributed, number per square millimeter 8 to 15, solitary or connected, solitary pores are oval or elliptic in outline, their diameter radially 120 to 240μ, tangentially 80 to 160μ, length of the vessel segments 300 to 700μ, end walls horizontal or slightly slanting, their perforation simple. Wood fibers 16 to 18μ in diameter, length 700 to 1,600μ, wall 3 to 4μ, thick. Wood parenchyma paratracheal and scattered. Pith rays heterogeneous, in two modifications: uniseriate ray cells upright, polyseriate rays 2 to 4 cells wide, up to 40 cells high, cells with dark reddish substance. No. 17556 B. F.

Rhizophoraceae

94) **Carallia integerrima** *de Candolle*

This genus is a very anomalous one in *Rhizophoraceae*. Wood reddish brown; it looks like *Helicia*, but it is remarkable for its content of flavone in heartwood.

Pores evenly distributed, but more or less in radial direction between large pith rays, number per square millimeter 4 or 5, tyloses present; mostly solitary, oval or round in outline, their diameter 120 to 260μ, length of the vessel segments 950 to 1,600μ, end walls slanting or horizontal, their perforation simple. Tracheids 1,500 to 2,000μ long. Wood fibers thick-walled, with small cavities, their diameter 20 to 25μ, length 1,700 to 3,200μ, wall 8 to 13μ thick. Wood parenchyma paratracheal, metatracheal and scattered; metatracheal bands 5 to 15 fibers distant from each other, 1 to 4 cells wide in radial direction. Pith rays heterogeneous, in two distinct modifications: uniseriate rays in fairly great number, cells upright; polyseriate rays up to 20 cells wide, height indefinitely great. No. 2097 T. S.

Combretaceae

95) **Lumnitzera littorea** *Voigt*

A small to medium sized tree, up to 50 centimeters in diameter, with a straight fairly long bole.

Pores connected radially, number per square millimeter 35 to 45; solitary pores are oval or elliptic in outline, their diameter radially 60 to 120μ, tangentially 50 to 100μ, length of the vessel segments 300 to 700μ, end walls

horizontal or slanting, their perforation simple. Wood fibers 16 to 18μ in diameter, length 800 to 1,500μ, wall 3 to 4μ thick. Wood parenchyma scattered. Pith rays heterogeneous, 1 to 3 fibers distant from each other, uniseriate, 1 to 15 cells high; cells with dark reddish substance. No. 1874 T. S.

96) **Terminalia Calamansanai** *Rolfe*

A tall straight tree up to 50 centimeters in diameter.

Pores evenly distributed, sometimes plugged with brown substance, number per square millimeter 2 to 4 connected radially; solitary pores are oval in outline, their diameter radially 150 to 300μ, tangentially 120 to 250μ, length of the vessel segments 450 to 850μ, their perforation simple. Wood fibers 20 to 25μ in diameter, length 1,100 to 2,000μ, wall 2μ in early wood, in late wood 3 to 4μ thick. Wood parenchyma metatracheal, paratracheal and scattered; metatracheal bands in regular tangential lines, 2 to 6 cells wide. Pith rays heterogeneous, but mostly of procumbent, uniseriate, 2 to 15 cells high. No. 17557 B. F.

97) **Terminalia Catappa** *Linnaeus*

A tree of medium height, up to 75 centimeters in diameter.

Number of pores per square millimeter 4 to 6; solitary pores are oval or round, sometimes elliptic in outline, their diameter 120 to 250μ, length of the vessel segments 250 to 550μ. Wood fibers 20 to 25μ in diameter, length 750 to 1,600μ, wall 3 to 4μ thick. Wood parenchyma paratracheal and scattered; paratracheal parenchyma spreading tangentially and becoming metatracheal parenchyma; large shizozenic cells present, with crystals of calcium oxalate. Pith rays nearly homogeneous, 1 to 4 cells wide, up to 20 cells high; cells with dark reddish substance. No. 6405 B. F.

98) **Terminalia comintana** *Merrill*

A tall fairly straight tree up to 100 centimeters or more in diameter.

Number of pores per square millimeter 8 to 12, solitary pores are oval or elliptic in outline, their diameter radially 100 to 200μ, tangentially 80 to 160μ, length of the vessel segments 130 to 400μ. Wood fibers 15 to 20μ in diameter, length 800 to 1,600μ, wall 3 to 4μ thick. Wood parenchyma paratracheal often spreading tangentially. Pith rays heterogeneous, mostly of procumbent ray cells, uniseriate sometimes biseriate, 3 to 30 cells high; upright ray cells with crystals of calcium oxalate. No. 14 Subig.

99) **Terminalia edulis** *Blanco*

A tall and straight tree up to 60 centimeters or more in diameter.

Number of pores per square millimeter 5 to 8, solitary sometimes connected, solitary pores are oval or elliptic in outline, their diameter radially 120 to 250μ, tangentially 100 to 200μ, length of the vessel segments 300 to 800μ; with very many bordered pits where they are in contact with each other, the bordered pits being angular in outline, their diameter 8μ. Wood fibers 16 to 20 in diameter, length 1,000 to 1,900μ, wall 3 to 4μ thick. Wood parenchyma paratracheal and scattered; the former often elongating tangentially. Pith rays heterogeneous, but nearly all cells procumbent, 1 to 4 cells wide, up to 25 cells high. No. 9882 B. F.

100) **Terminalia oocarpa** *Merrill*

A tall, straight tree up to 90 centimeters in diameter.

Number of pores per square millimeter 6 to 7, solitary or 2 to 4 connected mostly in radial direction, solitary pores are oval or elliptic in outline, their diameter radially 150 to 380μ, tangentially 100 to 300μ, length of the vessel segments 300 to 650μ; with very many bordered pits where they are in contact with each other, the diameter of border being 8μ. Wood fibers 20 to 25μ in diameter, length 1,000 to 2,000μ, wall 4μ thick. Wood parenchyma paratracheal, more or less metatracheal and scattered; metatracheal bands irregularly distributed; chambered parenchyma cells with crystals present in fairly great number. Pith rays heterogeneous, mostly of procumbent cells, 1 to 5 cells wide, up to 30 cells high. Museum Plank 16.

101) **Terminalia nitens** *Presl*

A tree up to 90 centimeters in diameter.

Number of pores per square millimeter 4 to 8, solitary or connected, solitary pores are oval or round in outline, their diameter radially 150 to 300μ, tangentially 100 to 280μ, length of the vessel segments 300 to 650μ. Wood fibers 14 to 18μ in diameter, length 1,000 to 1,900μ, wall 4μ thick. Wood parenchyma paratracheal and scattered; paratracheal parenchyma often spreading tangentially. Pith rays heterogeneous, cells mostly procumbent, 1 to 4 cells wide, up to 30 cells high. No. 13302 B. F.

Myrtaceae

102) **Eugenia clausa** *C. B. Robinson*

A tree up to 100 centimeters in diameter.

Pores evenly distributed, number per square millimeter 15 to 25, mostly connected in radial or diagonal direction, solitary pores are elliptic, oval or round in outline, their diameter radially 70 to 140μ, tangentially 70 to 130μ, length of the vessel segments 450 to 1,000μ, end walls horizontal or slanting, their perforation simple. Wood fibers with small cavities, 14 to 16μ in diameter, length 1,200 to 1,800μ, wall 4 to 5μ thick. Wood parenchyma metatracheal and scattered; metatracheal bands 1 to 5 cells wide in radial direction, irregularly arranged. Pith rays heterogeneous, uniseriate ray cells upright, polyseriate 2 or 3 cells wide, usually flanked by large upright cells; cells with dark reddish substance. No. 7123 B. F.

103) **Eugenia bordenii** *Merrill*

Number of pores per square millimeter 8 to 13, tyloses present; solitary or 2 to 4 connected mostly in radial direction, solitary pores are oval or elliptic in outline, their diameter radially 150 to 300μ, tangentially 120 to 200μ, length of the vessel segments 500 to 1,000μ. Wood fibers 20 to 25μ in diameter, length 1,300 to 2,100μ, wall 4 to 6μ thick. Wood parenchyma partly paratracheal, metatracheal and scattered; metatracheal bands 2 to 4 cells wide in radial direction. Pith rays heterogeneous, uniseriate ray cells upright, polyseriate rays 2 or 3 cells wide, usually flanked by upright uniseriate ray cells, cells plugged with dark reddish substance. No. 17590 B. F.

104) **Eugenia glaucicalyx** *Merrill*

A tree up to 80 centimeters in diameter.

Pores arranged more or less radially, number of pores per square millimeter 10 to 15, usually connected in radial direction, solitary pores are oval or round in outline, their diameter, 150 to 250μ, length of the vessel segments 600 to 1,000μ. Tracheids 600 to 1,000μ long. Wood fibers 14 to 16μ in diameter, length 1,200 to 2,000μ, wall 4 to 5μ thick. Wood parenchyma paratracheal, metatracheal and scattered; metatracheal bands 1 to 3 cells wide in radial direction, arranged regularly. Pith rays heterogeneous, in two modifications, uniseriate ray cells present in fairly great number, cells upright; polyseriate rays 2 to 5 cells wide, up to 50 cells high, often flanked by many upright uniseriate ray cells. No. 7359 B. F.

105) **Planchonia** *sp.* *

Pores evenly distributed, number per square millimeter 8 to 10, mostly connected in radial direction, their diameter radially 120 to 220μ, tangentially 100 to 180μ, length of the vessel segments 400 to 800μ, end walls horizontal or slanting, their perforation simple; with very many bordered pits where they are in contact with each other, the diameter of border being about 8μ. Wood fibers 20 to 25μ in diameter, length 1,300 to 2,300μ, wall 4 to 6μ thick. Wood parenchyma metatracheal, one cell wide; chambered parenchyma cells present, with crystals. Pith rays heterogeneous, 1 to 4 cells high. No. 6062 B. F.

106) **Xanthostemon verdugonianus** *Naves*

A tree up to 115 centimeters in diameter, but generally with a very short and irregular trunk.

Pores evenly distributed, number per square millimeter 20 to 26, usually plugged with dark reddish substance, their diameter radially 60 to 112μ, tangentially 50 to 100μ, length of the vessel segments 300 to 500μ, end walls horizontal or slanting, their perforation simple. Wood fibers with very narrow cavities, 16 to 18μ in diameter, length 600 to 1,300μ, wall 6 to 8μ thick. Wood parenchyma scarce and scattered. Pith rays heterogeneous, 1 or 2 cells wide, up to 20 cells high, cells with dark reddish substance. No. 1106 T. S.

Lecythidaceae

107) **Petersianthus quadrialatus** *Merrill*

A tall straight tree up to 100 centimeters in diameter.

Number of pores per square millimeter 5 or 6, solitary or 2 to 3 connected mostly in radial direction, solitary pores are oval or elliptic in outline, their diameter radially 150 to 300μ, tangentially 120 to 250μ, length of the vessel segments 500 to 800μ. Wood fibers 20 to 26μ in diameter, length 1,400 to 2,800μ, wall $4^1/_2$ to 6μ thick. Wood parenchyma paratracheal, metatracheal and scatted; metatracheal bands irregularly arranged. Pith rays heterogeneous, 1 to 7 cells wide, up to 40 cells high. No. 4526 B. F.

* The identity of this specimen is not well established. The structure of the wood is similar to *Planchonia spectabilis Merrill*, but is finer textured. This, however, may only be due to the fact that the specimen was obtained from a young tree.—L. J. B.

Melastomaceae

108) **Medinilla** *sp.*

Pores evenly distributed, number per square millimeter 24 to 29, mostly grouped, their diameter 50 to 100μ, length of the tracheid-vessel segments 550 to 900μ, end walls slanting, their perforation simple; with scalariform bordered pits where they are in contact with each other. Wood fibers septate, 16 to 20μ in diameter, length 500 to 700μ, wall 3μ thick. Pith rays heterogeneous, uniseriate, in regular palisade, up to 20 cells high; cells with dark reddish substance. No. 18095 B. F.

Lythraceae

109) **Lagerstroemia piriformis** *Koehne*

A tree up to 90 centimeters in diameter; straight but not tall.

Ring-porous; number of pores per square millimeter 2 to 4, mostly solitary, round or depressed in radial direction, their diameter 100 to 300μ, length of the vessel segments 250 to 500μ, end walls horizontal or slanting, their perforation simple; with slit-like bordered pits where they are in contact with each other. Wood fibers always septate, 20 to 25μ in diameter, length 950 to 1,900μ, wall 3 to 4μ thick. Wood parenchyma paratracheal, metatracheal (terminal?), and scattered; metatracheal bands in regular tangential lines; paratracheal parenchyma often spreading wing-like tangentially; chambered parenchyma cells present in great number, with crystals of calcium oxalate. Pith rays nearly homogeneous, 1 to 4 fibers distant from each other, uniseriate, rarely biseriate in part, height variable; cells with dark reddish substance. No. 1382 T. S.

110) **Lagerstroemia speciosa** *Persoon*

Ring-porous; pores gradually diminishing in size in the late wood, number per square millimeter 4 or 5; tyloses present; usually solitary sometimes 2 connected, solitary pores are oval or round in outline, their diameter 150 to 300μ, length of the vessel segments 200 to 500μ. Wood fibers septate, 20 to 22μ in diameter, length 750 to 1,700μ, wall 3 to 4μ in early wood, in late wood 4 to 5μ thick. Wood parenchyma terminal, metatracheal, paratracheal and scattered; metatracheal bands 2 to 6 cells wide, irregularly arranged; idioblasts present. Pith rays homogeneous, uniseriate, up to 20 cells high; cells with dark reddish substance. No. 1358 T. S.

111) **Sonneratia pagatpat** *Blanco*

A medium-sized to tall tree of mangrove swamps, up to 100 centimeters in diameter, generally with a straight regular bole.

Pores evenly distributed, number per square millimeter 20 to 24, mostly connected in radial direction, solitary pores are oval or elliptic in outline, their diameter radially 80 to 180μ, tangentially 70 to 150μ, length of the vessel segments 250 to 600μ, end walls horizontal or slanting, their perforation simple; with very many bordered pits where they are in contact with each other, the diameter of border being about 7μ. Wood fibers 22 to 30μ in diameter, length 650 to 1,500μ, wall 5 to 6μ thick. Wood parenchyma scattered. Pith rays heterogeneous, 1 or 2 fibers distant from each other, uniseriate sometimes biseriate, 3 to 15 cells high; cells with dark reddish substance, sometimes with crystals of calcium oxalate. No. 1451 T. S.

Samydaceae

112) **Homalium ! luzoniense** *F.-Villar ?*

A tree up to 70 centimeters in diameter.

Pores evenly distributed, number per square millimeter 16 to 24, solitary or connected, their diameter 80 to 160μ, length of the vessel segments 800 to 1,250μ, end walls horizontal or slanting, their perforation simple. Wood fibers 18 to 22μ in diameter, length 1,300 to 2,100μ, wall 5 to 7μ thick. Wood parenchyma scattered. Pith rays heterogeneous, 1 to 5 cells wide, cells very often with crystals of calcium oxalate. No. 2016 T. S.

Datiscaceae

113) **Octomeles sumatrana** *Miquel*

Pores evenly distributed, number per square millimeter 2 to 5; solitary sometimes 2 connected, round or oval in outline, their diameter 150 to 320μ, length of the vessel segments 250 to 600μ, their perforation simple, side walls 2 to 3μ, common boundary walls of two vessels 4μ thick; with very many bordered pits where they are in contact with each other, the bordered pits arranged in an alternating fashion, the diameter being about 8μ. Wood fibers arranged radially, their diameter 26 to 30μ, length 900 to 1,500μ, wall 3 to 4μ thick. Wood parenchyma paratracheal and scattered. Pith rays nearly homogeneous, 1 to 4 cells wide, up to 40 cells high. No. 22246 B. F.

Rubiaceae

114) **Neonauclea! calycina** (*Bartlet*) *Merrill ?*

A tree up to 80 centimeters in diameter. Water extracts of wood chips give distinct fluorescence but soon disappears by adding ammonia solution.

Pores evenly distributed, number per square millimeter 9 to 12, mostly solitary, oval or elliptic in outline, their diameter up to 100 to 200μ, their perforation simple. Wood fibers 14 to 18μ in diameter, wall 4 to 5μ thick. Wood parenchyma metatracheal and scattered, the former one cell wide in radial direction, irregularly arranged. Pith rays heterogeneous: uniseriate ray cells upright; polyseriate rays 2 or 3 cells wide, cells procumbent, always flanked by upright uniseriate ray cells. Museum Pillar 5.

Sapotaceae

115) **Bassia ramiflora** *Merrill* (*Illipe ramiflora Merrill*) Fig. 9

A tree up to 60 centimeters in diameter.

Pores evenly distributed, number per square millimeter 2 to 5, solitary or 2 or more connected mostly in radial direction, solitary pores are oval or elliptic in outline, their diameter radially 150 to 250μ, tangentially 120 to 200μ, length of the vessel segments 650 to 1.400μ, end walls horizontal or slanting, their perforation simple, side walls 3 to 4μ, common boundary walls of two vessels 4 to 5μ thick; with very many bordered pits where they are in contact with each other, the diameter of border being 9 to 10μ. Wood fibers 40 to 50μ in diameter, length 1,600 to 2,800μ, wall 2 to 4μ thick. Wood parenchyma metatracheal and scattered; metatracheal parenchyma variably distanced from each other, one cell wide in radial direction. Pith rays heterogeneous, mostly of upright cells, 1 or 2 fibers distant from each other, uniseriate, height variable, 2 or more rays often connecting vertically. No. 5354 B. F.

116) **Bassia betis Merrill** (*Illipe betis Merrill*)

A tree up to 100 centimeters in diameter.

Pores connected mostly in radial direction, number per square millimeter 6 to 8, solitary pores are oval or elliptic in outline, their diameter radially 140 to 280μ, tangentially 120 to 220μ, length of the vessel segments 500 to 1,000μ, end walls horizontal or slanting, their perforation simple; with very many bordered pits where they are in contact with each other, the dia-

meter of border being about 7μ. Wood fibers 20 to 25μ in diameter, length 1,000 to 2,000μ, wall 5 to 7μ thick. Wood parenchyma paratracheal, metatracheal; in the latter case 2 to 5 fibers distant from each other, one cell wide in radial direction, rather regularly arranged. Pith rays heterogeneous, 1 to 3 fibers distant from each other; uniseriate ray cells large and upright; polyseriate rays 2 or 3-seriate, cells mostly of procumbent, up to 28 cells high; cells plugged with dark reddish substance. No. 1485 T. S.

117) **Mimusops parviflora** *R. Brown*

Pores arranged radially, number per square millimeter 30 to 38; tyloses present; mostly connected in radial direction, their diameter 50 to 120μ, length of the vessel segments 300 to 800μ, end walls horizontal or slanting, their perforation simple. Wood fibers 20 to 25μ in diameter, length 700 to 1,700μ, wall 4 to 6μ thick. Wood parenchyma metatracheal, in regular tangential lines, 2 to 9 fibers distant from each other, 1 to 4 cells wide in radial direction. Pith rays heterogeneous, 1 or 2 cells wide, up to 20 cells high; cells with dark reddish substance. No. 22515 B. F.

118) **Sideroxylon macranthum** *Merrill*

A large tree up to 80 centimeters in diameter.

Pores arranged in radial direction, number per square millimeter 10 to 13, mostly in groups sometimes solitary, in the former case 2 to 10 connected radially, solitary pores are elliptic in outline, their diameter radially 120 to 220μ, tangentially 80 to 180μ, length of the vessel segments 550 to 870μ, their perforation simple, side walls 3 to 5μ, common boundary walls of two vessels 5 to 8μ thick; with very many bordered pits where they are in contact with each other, the diameter of border being 8μ. Wood fibers 14 to 18μ in diameter, length 800 to 1,900μ, wall 3 to 4μ thick. Wood parenchyma metatracheal, paratracheal and scattered; metatracheal bands 5 to 10 fibers distant from each other, 1 to 3 cells wide in radial direction; chambered parenchyma cells present in great number, with crystals of calcium oxalate. Pith rays heterogeneous 1 to 3 fibers distant from each other; uniseriate rays generally of upright cells; polyseriate rays 2 to 4 cells wide, 10 to 25 cells high, always flanked by a few large upright uniseriate ray cells. No. 6074 B. F.

119) **Palaquium philippense** (*Perrottet*) *C. B. Robinson*

Pores connected mostly in radial direction, number per square millimeter

8 to 14, solitary pores are oval or elliptic in outline, their diameter radially 100 to 220μ, tangentially 90 to 200μ, length of the vessel segments 500 to 900μ their perforation simple. Tracheids 500 to 850μ long. Wood fibers 20 to 30μ, length 1,000 to 2,100μ, wall 4 to 7μ thick. Wood parenchyma metatracheal and scattered; metatracheal bands one cell wide, irregularly arranged; chambered parenchyma cells present in great number, cells with crystals of calcium oxalate. Pith rays heterogeneous 1 to 3 fibers distant from each other, 1 to 3 cells wide, two rays often connecting vertically. No. 17577 B. F.

120) **Palaquium luzoniense** *Vidal*

Pores usually connected in radial direction, number per square millimeter 7 to 12, solitary pores are elliptic or oval in outline, their diameter radially 100 to 220μ, tangentially 100 to 200μ, length of the vessel segments 450 to 1,400μ; with very small slit-like bordered pits where they are in contact with each other. Tracheids 900 to 1,300μ long. Wood fibers 20 to 30μ in diameter, length 1,100 to 2,000μ, wall 4 to 5μ thick. Wood parenchyma metatracheal and scattered; metatracheal bands 5 to 15 fibers distant from each other, 1 or 2 cells wide in radial direction; cells with dark reddish substance. Pith rays heterogeneous, 1 or 2 sometimes 3 cells wide; uniseriate ray cells upright; polyseriate rays flanked by upright ray cells. No. 17546 B. F.

Ebenaceae

121) **Maba buxifolia** *Persoon*

A tree up to 40 centimeters in diameter.

Pores distributed radially, often plugged with resinous substance, number of pores per square millimeter 9 to 13, mostly connected in radial direction, solitary pores are oval or elliptic in outline, their diameter radially 60 to 130μ, tangentially 60 to 100μ, length of the vessel segments 250 to 450μ, end walls horizontal or slanting, their perforation simple; with very many bordered pits where they are in contact with each other, the diameter of border being 5μ. Wood fibers 10 to 14μ in diameter, length 950 to 1,400μ, wall $2^1/_2$ to $3^1/_2\mu$ thick; often with resinous substance in cavities. Wood parenchyma paratracheal, metatracheal; in the latter case 1 to 3 cells wide in radial direction, arranged in wavy tangential lines; chambered parenchyma

present, cells with crystals of calcium oxalate. Pith rays heterogeneous, present in great number, uniseriate, sometimes biseriate, height variable. No. 1866 T. S.

122) **Diospyros discolor** *Willdenow*

The best known and one of the largest trees of the genus reaching ordinarily up to 60 centimeters in diameter.

Pores evenly distributed, mostly connected in radial direction, number per square millimeter 6 to 10, often plugged with dark reddish substance; solitary pores are oval or elliptic in outline, their diameter radially 100 to 220μ, tangentially 90 to 180μ, length of the vessel segments 350 to 650μ. Wood fibers arranged in radial direction, their diameter 15 to 18μ in diameter, length 600 to 1,300μ, wall 2 to 3μ thick. Metatracheal parenchyma one sometimes two cells wide in radial direction, variably distanced from each other. Pith rays heterogeneous, uniseriate, plugged with dark reddish substance. No. 1131 T. S.

123) **Diospyros philippinensis** *A. de Candolle*

A tree up to 30 centimeters in diameter.

Pores mostly connected in radial direction, number per square millimeter 17 to 25, often plugged with dark reddish substance, solitary pores are oval or round in outline, their diameter radially 70 to 150μ, tangentially 60 to 130μ, length of the vessel segments 300 to 550μ. Wood fibers 14 to 17μ in diameter, length 650 to 1,100μ, wall 3 to 4μ thick. Metatracheal parenchyma one or two cells wide in radial direction; chambered parenchyma cells present, with crystals of calcium oxalate. Pith rays heterogeneous, uniseriate, cells mostly with crystals of calcium oxalate. No. 17563 B. F.

124) **Diospyros mindanaensis** *Merrill*

A tree up to 50 centimeters in diameter.

Pores mostly connected in radial direction, number per square millimeter 6 to 10, their diameter radially 70 to 150μ, tangentially 70 to 140μ, length of the vessel segments 450 to 550μ, side walls 3 to 6μ, common boundary walls of two vessels 6 to 8μ thick; with very many small bordered pits where they are in contact with each other, the diameter of border being 3μ. Wood fibers arranged in radial direction, 14 to 16μ in diameter, length 900 to 1,600μ, wall 4μ thick. Wood parenchyma metatracheal, 6 to 15 fibers

distant from each other, one sometimes two cells wide in radial direction. Pith rays heterogeneous, 1 to 3 fibers distant from each other, uniseriate, 2 to 15 cells high. No. 5211 B. F.

125) **Diospyros pilosanthera** *Blanco* Fig. 10

A tree up to 50 centimeters in diameter.

Pores evenly distributed, number per square millimeter 6 to 8; tyloses often present; solitary sometimes 2 or more connected radially, solitary pores are oval or elliptic in outline, their diameter radially 90 to 180μ, tangentially 70 to 150μ, length of the vessel segments 300 to 700μ, side walls 5 to 6μ, common boundary walls of two vessels 6 to 8μ thick. Wood fibers 14 to 16μ in diameter, length 700 to 1,500μ, wall $2^1/_2$ to 3μ thick. Wood parenchyma paratracheal, metatracheal and scattered; metatracheal bands one cell wide, arranged in wavy tangential lines. Pith rays heterogeneous, uniseriate, cells often with crystals of calcium oxalate. No. 5389 B. F.

Apocynaceae

126) **Alstonia scholaris** *R. Brown*

A tall straight tree up to 100 centimeters or more in diameter.

Number of pores per square millimeter 3 to 5, mostly connected in radial direction, sometimes in circular groups; solitary pores are oval or elliptic in outline, their diameter radially 150 to 320μ, tangentially 140 to 280μ, length of the vessel segments 650 to 1,000μ. Wood fibers 25 to 40μ in diameter, length 1,000 to 2,000μ, wall 2 to 3μ thick. Wood parenchyma partly paratracheal and scattered; metatracheal bands 1 to 3 cells wide in radial direction, variably distanced from each other. Pith rays heterogeneous, uniseriate ray cells upright, polyseriate rays 2 or 3-seriate, usually flanked by upright ray cells. No. 17512 B. F.

127) **Kopsia longiflora** *Merrill*

Pores arranged radially, number per square millimeter 50 to 65, mostly connected in radial direction, polygonal in outline, their diameter up to 50μ, length of the vessel segments 550 to 750μ, end walls slightly slanting, their perforation simple; with very many bordered pits where they are in contact with each other, the diameter of border being about 3 to 4μ. Wood fibers 14 to 16μ in diameter, length 950 to 1,600μ, wall 3 to 4μ thick. Wood parenchyma metatracheal, one cell wide in radial direction. Pith rays

heterogeneous, 1 to 3 fibers distant from each other, uniseriate, cells mostly upright. No. 5453 B. F.

128) **Wrightia laniti** (*Blanco*) *Merrill*

A tree up to 60 centimeters in diameter.

Pores distributed in radial direction, 2 to 8 connected radially; number per square millimeter 22 to 30; solitary pores are elliptic in outline, their diameter radially 70 to 120μ, tangentially 50 to 100μ, length of the vessel segments 250 to 450μ, their perforation simple. Wood fibers 15 to 18μ in diameter, length 750 to 1,400μ, wall 2 to $2^1/_2\mu$ thick. Wood parenchyma paratracheal, terminal and scattered; metatracheal bands one cell wide; rather irregularly distributed. Pith rays heterogeneous, 1 to 3 fibers distant from each other; uniseriate and biseriate: uniseriate rays 1 to 9 cells high, cells upright; biseriate rays always flanked by upright uniseriate ray cells. No. 5378 B. F.

129) **Fagraea cochinchinensis** (*Loureiro*) *A. Chevalier*

A tree up to 90 centimeters in diameter but generally much smaller and with rather short and often irregular bole.

Pores evenly distributed; tyloses present; number per square millimeter 3 to 5, their diameter 150 to 300μ, end walls constricted in ends, their perforation simple. Wood fibers with very narrow cavities, 20 to 30μ in diameter, length 1,200 to 1,800μ, wall 8 to 12μ thick. Wood parenchyma metatracheal, 1 to 4 cells wide in radial direction, regularly arranged. Pith rays heterogeneous, uniseriate, up to 20 cells high. No. 1283 T. S.

Bignoniaceae

130) **Radermachera pinnata** *Seem*

A tree up to 80 centimeters in diameter.

Pores evenly distributed, number per square millimeter 15 to 19, mostly solitary, round in outline, their diameter 90 to 180μ, length of the vessel segments 350 to 550μ, their perforation simple; with very many bordered pits where they are in contact with each other, the diameter of border being about 4μ. Wood fibers 20 to 25μ in diameter, length 1,000 to 1,500μ, wall 3μ thick. Wood parenchyma paratracheal and scattered; paratracheal parenchyma often elongating tangentially. Pith rays homogeneous, 1 to 3 cells wide, up to 30 cells high. No. 9117 B. F.

Verbenaceae

131) **Avicennia officinalis** *Linnaeus*

A medium-sized tree up to 60 centimeters in diameter, growing in mangrove swamps.

Pores evenly distributed, number per square millimeter 25 to 40, often connected in radial direction, oval or elliptic in outline, their diameter 40 to 90μ, length of the vessel segments 200 to 300μ, end walls slanting, their perforation simple; with very many bordered pits where they are in contact with each other, the bordered pits being arranged like the cells of a honey comb with a diameter of about 3 to 4μ. Characteristics of the species are the presence of interxylary phloem and stone cells (sclerenchymatous rings); the former distributed on the inner side of the tangential bands of stone cells; the bands of stone cells accompanied by wood parenchyma cells, arranged in regular tangential lines, frequently branched, 2 to 4 cells wide in radial direction, cells with small cavities, diameter being about 30 to 45μ. Wood fibers are the principal elements of the wood, 16 to 20μ in diameter, length 500 to 1,200μ, wall 2 to 4μ thick. Pith rays heterogeneous, 1 to 4 cells wide, up to 30 cells high, cells nearly always plugged with crystals of calcium oxalate. No. 2039 T. S.

132) **Tectona grandis** *Linnaeus*

Ring-porous; number of pores per square millimeter in early wood 4 or 5, gradually diminishing in size through the intermediate to the late wood; solitary sometimes 2 or 3 connected; early wood pores elliptic or oval in outline, their diameter radially 250 to 400μ, tangentially 200 to 300μ; length of the vessel segments 300 to 500μ, end walls horizontal or slanting, their perforation simple; side walls 4 to 5μ, common boundary walls of two vessels 6 to 8μ thick, with very many bordered pits where they are in contact with each other, the diameter of border being 8 to 9μ. Wood fibers septate, 20 to 25μ in diameter, length 1,000 to 2,000μ, wall 4μ in early wood, in late wood 4 to 6μ thick. Wood parenchyma paratracheal and scattered. Pith rays nearly homogeneous, 3 to 10 fibers distant from each other, 1 to 4 cells wide, up to 30 cells high. No. 800 T. S.

133) **Vitex parviflora** *Jussieu*

A tree up to 200 centimeters in diameter, with generally a short,

crooked and fluted bole.

Pores evenly distributed, number per square millimeter 14 to 22μ; tyloses present; solitary or round in outline, their diameter radially 100 to 200μ, tangentially 80 to 160μ, length of the vessel segments 200 to 500μ, end walls horizontal or slanting, their perforation simple. Wood fibers 16 to 22μ in diameter, length 600 to 1,300μ, wall 4 to 5μ thick. Wood parenchyma partly paratracheal and scattered. Pith rays homogeneous, 1 to 4 cells wide, up to 32 cells high, cells often with crystals of calcium oxalate. Museum Plank 143.

134) **Vitex aherniana** *Merrill*

A tree up to 75 centimeters in diameter.

Pores evenly distributed, number per square millimeter 16 to 18; tyloses conspicuous; solitary or 2 to 4 connected radially, solitary pores are round in outline, their diameter 100 to 200μ, length of the vessel segments 280 to 500μ, end walls horizontal or slanting, their perforation simple. Wood fibers 16 to 18μ in diameter, length 600 to 1,400μ, wall 5 to 8μ thick. Wood parenchyma scattered. Pith rays nearly homogeneous; marginal cells sometimes upright, 1 to 3 cells wide, up to 20 cells high; wall 4 to 7μ thick. Museum Plank 25.

Myristicaceae

135) **Myristica philippensis** *Lamarck* Fig. 11

A large tree up to 80 centimeters in diameter.

Pores evenly distributed, number per square millimeter 2 to 7; solitary or in groups, in the latter case 2 or 3 connected radially; solitary pores are oval or elliptic in outline, their diameter radially 150 to 230μ, tangentially 120 to 180μ; length of the vessel segments 1,000 to 1,400μ, end walls slanting, their perforation scalariform, cross bars 1 to 4; side walls 5 to 7μ, common boundary walls of two vessels 7 to 10μ; with very many bordered pits where they are in contact with each other, the bordered pits being arranged like the cells of a honey comb with a diameter of about 9 to 10μ. Wood fibers arranged radially, 16 to 20μ in diameter, length 1,200 to 2,000μ, wall 2 to $3^1/_2\mu$ thick. Wood parenchyma paratracheal, metatracheal and scattered among fibers; paratracheal parenchyma one cell wide; metatracheal bands regularly arranged in tangential lines but variably

distanced from each other, 3 to 10 cells wide in radial direction. Pith rays heterogeneous, 1 to 3 fibers distant from each other, 1 or 2-seriate, 1 to 20 cells high. No. 17541 B. F.

136) **Knema heterophylla** *Warburg* Fig. 12

A tree up to 60 centimeters in diameter.

This species anatomically resembles the former. Pores evenly distributed, number per square millimeter 5 to 8, solitary pores are oval or elliptic in outline, their diameter radially 120 to 200μ, tangentially 100 to 150μ, length of the vessel segments 750 to 1,200μ, their perforation scalariform, cross bars 3 to 7. Wood fibers 16 to 20μ in diameter, length 750 to 1,500μ, wall 2 to 3μ thick. Wood parenchyma paratracheal, metatracheal and scattered. Pith rays heterogeneous, 1 to 3 fibers distant from each other, 1 or 2 cells wide, 3 to 30 cells high. No. 17566 B. F.

Lauvineae

137) **Cryptocaria bicolor** *Merrill*

A medium-sized tree up to 40 centimeters or more in diameter.

Pores evenly distributed, number per square millimeter 8 to 14, often plugged with resinous substance, solitary or 2 to 5 connected radially, solitary pores are oval or round in outline, their diameter radially 90 to 200μ, tangentially 80 to 170μ, length of the vessel segments 300 to 600μ. Wood fibers 15 to 18μ in diameter, length 900 to 1,500μ, wall 3μ thick. Wood parenchyma paratracheal, terminal, and scattered. Pith rays heterogeneous, polyseriate ray cells always procumbent, 1 to 5 cells wide, up to 70 cells high, often flanked by a few upright ray cells. No. 6548 B. F.

138) **Beilschmiedia cairocan** *Vidal*

A tree up to 90 centimeters in diameter.

Pores evenly distributed, number per square millimeter 20 to 28, solitary or in groups, solitary pores are oval or round in outline, their diameter 100 to 200μ, length of the vessel segments 400 to 800μ, end walls horizontal or slanting, their perforation simple sometimes scalariform. Wood fibers septate, 16 to 18μ in diameter, length 600 to 1,900μ, wall 3 to 4μ thick. Wood parenchyma paratracheal and scattered; secretory cells present in fairly great number. Pith rays heterogeneous, 1 to 3 cells wide, up to 30 cells high. No. 7125 B. F.

139) **Cinnamomum mercadoi** *Vidal*

A small to medium sized tree up to 65 centimeters in diameter, generally straight but not very tall.

Pores evenly distributed, number per square millimeter 20 to 28, usually in groups, sometimes solitary, they are elliptic in outline, their diameter radially 70 to 150μ, tangentially 70 to 140μ, length of the vessel segments 450 to 850μ, their perforation simple; with very many bordered pits where they are in contact with each other, the diameter of border being 9 to 10μ. Wood fibers 16 to 18μ in diameter, length 800 to 1,700μ, wall 3 to 4μ thick. Wood parenchyma paratracheal and scattered, secretory cells present in fairly great number. Pith rays heterogeneous, 1 to 3 cells wide, up to 22 cells high. No. 12928 B. F.

140) **Litsea perrottetii** *F.-Villar*

A tree up to 45 centimeters or more in diameter.

Pores evenly distributed, number per square millimeter 10 to 13; tyloses sometimes present; solitary or 2 connected; solitary pores are usually round in outline, their diameter 80 to 200μ, length of the vessel segments 300 to 700μ, their perforation simple; with very many bordered pits where they are in contact with each other, the bordered pits angular in outline by mutual contact, their diameter being about 9 to 11μ. Wood fibers 25 to 30μ in diameter, length 850 to 1,800μ, wall 2 to 3 thick. Wood parenchyma paratracheal and scattered; paratracheal parenchyma often connecting tangentially; secretory cells sometimes present. Pith rays heterogeneous, 2 to 5 cells wide, 3 to 30 cells high. No. 6061 B. F.

141) **Phoebe sterculioides** *Merrill*

A tree up to 75 centimeters in diameter,

Pores evenly distributed, number per square millimeter 15 to 20; solitary or in groups, in the latter case 2 to 4 connected mostly in radial direction; solitary pores are round or polygonal in outline, their diameter 100 to 200μ, length of the vessel segments 750 to 1,200μ, their perforation simple; the inner surface of the wall with striations. Wood fibers septate, 25 to 30μ in diameter, length 1,000 to 1,800μ, wall 3 to 4μ thick. Wood parenchyma paratracheal and scattered; secretory cells present. Pith rays heterogeneous, 1 to 3 cells wide, up to 25 cells high; cells with dark reddish substance. No. 17495 B. F.

Thymelaeaceae

142) **Gonystylus bancanus** (*Miquel*) *Gilg*

Pores evenly distributed; number per square millimeter 5 to 7, solitary or in groups, in the latter case 2 or more connected; solitary pores are oval, round or somewhat polygonal in outline, their diameter radially 80 to 160μ, tangentially 70 to 150μ, length of the vessel segments 220 to 600μ, end walls horizontal, their perforation simple, side walls 3 to 5μ, common boundary walls of two vessels 5 to 6μ thick. Tracheid-fibers 20 to 26μ in diameter, length 1,000 to 1,800μ, wall 3μ thick; with very many semi-bordered pits where they are in contact with each other. Wood parenchyma metatracheal, paratracheal and scattered; metatracheal bands variably distanced from each other. Pith rays heterogeneous, 1 to 3 fibers distant from each other, uniseriate, 3 to 18 cells high. No. 10625 B. F.

Euphorbiaceae

143) **Aporosa symplocosifolia** *Merrill*

Pores connected mostly in radial direction, number per square millimeter 25 to 32, solitary pores are elliptic in outline, their diameter radially 60 to 110μ, tangentially 50 to 100μ, length of the vessel segments 800 to 1,500μ, their perforation simple, side walls 3 to 4μ, common boundary walls of two vessels 4 to 5μ thick; the inner surface of the wall with striations; with very many bordered pits where they are in contact with each other, the diameter of border being 7 to 8μ. Wood fibers 3 to 6 sided in cross section, with small cavities, 20 to 25μ in diameter, length 1,600 to 3,000μ, wall 6 to 8μ thick. Wood parenchyma more or less metatracheal, 1 to 3 fibers distant from each other, one cell wide in radial direction. Pith rays heterogeneous, 1 to 3 fibers distant from each other, 1 to 5 cells wide, height indefinitely great. No. 5775 B. F.

144) **Antidesma edule** *Merrill*

Pores evenly distributed, number per square millimeter 38 to 50, mostly connected in radial direction, their diameter 30 to 60μ, length of the vessel segments 400 to 1,100μ, their perforation simple. Wood fibers (tracheid-fibers ?) 20 to 25μ in diameter, length 1,300 to 2,500μ, wall 6 to 8μ thick. Wood parenchyma scarce and scattered. Pith rays heterogeneous, in two modifications: uniseriate rays numerous, cells upright; polyseriate rays

2 or 3 cells wide, up to 80 cells (1.5 millimeters) high. No. 17517 B. F.

145) **Bischofia javanica** *Blume*

Pores usually connected in radial direction, number per square millimeter 5 to 8, solitary pores are oval or elliptic in outline, their diameter radially 120 to 250μ, tangentially 100 to 220μ, length of the vessel segments 700 to 1,300μ, their perforation simple. Tracheids 850 to 1,300μ long. Wood fibers septate, 25 to 45μ in diameter, length 1,800 to 3,000μ, wall 4 to 6μ thick. Wood parenchyma scattered. Pith rays 1 to 3 fibers distant from each other, heterogeneous, in two modifications: uniseriate ray cells upright; polyseriate rays 2 to 4 cells wide, up to 70 cells high, usually flanked by upright uniseriate ray cells. No. 5356 B. F.

146) **Cyclostemon grandifolius** *C. B. Robinson*

A tree up to 95 centimeters in diameter.

Pores mostly connected radially, number per square millimeter 11 to 16, solitary pores are oval or elliptic in outline, their diameter radially 70 to 150μ, tangentially 60 to 120μ, length of the vessel segments 1,000 to 2,000μ, end walls slanting, their perforation scalariform, cross bars 14 to 40; with very many small bordered pits where they are in contact with each other, the diameter of border being 3 to 4μ. Wood fibers with very narrow cavities, 20 to 25μ in diameter, length 1,200 to 2,800μ, wall 8 to 10μ thick. Wood parenchyma metatracheal and scattered; metatracheal bands one cell wide, variably distanced from each other; cells often with crystals of calcium oxalate. Pith rays heterogeneous, 1 or 2 fibers distant from each other; uniseriate ray cells upright, cells often with crystals of calcium oxalate; polyseriate rays 2 or 3 cells wide, cells procumbent, very small in tangential section, up to 30 cells high; 2 or more rays often connecting vertically. No. 6094 B. F.

147) **Endospermum peltatum** *Merrill*

A moderately tall, straight tree up to 75 centimeters in diameter.

Pores evenly distributed, number per square millimeter 2 to 4, mostly in groups, sometimes solitary, in the former case 2 to 4 connected radially; solitary pores are oval or elliptic in outline, their diameter radially 200 to 350μ, tangentially 150 to 300μ, length of the vessel segments 750 to 1,200μ, their perforation simple, side walls 5 to 8μ, common boundary walls of two vessels 6 to 10μ thick; with very many bordered pits where they are in

contact with each other, the bordered pits arranged in an alternating fashion, their diameter being 14 to 16μ. Wood fibers 40 to 50μ in diameter, length 900 to 2,100μ, wall 4μ thick. Wood parenchyma metatracheal and scattered; metatracheal parenchyma 1 or 2 cells wide in radial direction; chambered parenchyma cells sometimes present, with crystals of calcium oxalate. Pith rays heterogeneous, 1 to 3 fibers distant from each other, 1 or 2-seriate; uniseriate ray cells always upright; biseriate rays up to 20 cells high, always flanked by many upright uniseriate ray cells. No. 1859 T. S.

Urticaceae

148) **Gymnartocarpus woodii** *Merrill*

Pores evenly distributed, number per square millimeter 1 to 4; solitary or 2 to 6 connected; solitary pores are oval in outline, their diameter radially 200 to 350μ, tangentially 150 to 300μ, length of the vessel segments 500 to 750μ, their perforation simple. Wood fibers 20 to 28μ in diameter, length 900 to 1,800μ, wall 3 to 4μ thick. Wood parenchyma paratracheal, metatracheal; metatracheal bands 3 to 10 cells wide, very conpicuous on cross section. Pith rays homogeneous, 1 to 4 cells wide, up to 30 cells high; horizontal resin canals present, surrounded by small ray cells. No. 17584 B. F.

149) **Artocarpus communis** *Forster*

A tree up to 90 centimeters in diameter; wood contains flavone.

Pores evenly distributed, number per square millimeter 4 to 6; tyloses sometimes present; solitary or 2 to 4 connected mostly in radial direction; solitary pores are oval or elliptic in outline, their diameter radially 150 to 320μ, tangentially 140 to 260μ, length of the vessel segments 300 to 600μ, their perforation simple; with very many bordered pits where they are in contact with each other, the bordered pits angular in outline by mutual contact, their diameter being 10 to 12μ. Wood fibers arranged radially, 24 to 26μ in diameter, length 1,100 to 2,200μ, wall 3 to 4μ thick. Wood parenchyma paratracheal and scattered. Pith rays heterogeneous, 1 to 5 cells wide, up to 30 cells high; uniseriate rays rather scarce, cells upright; polyseriate rays usually flanked by a few large upright cells. No. 22507 B. F.

150) **Artocarpus cumingiana** *Trecul*

A tree up to 100 centimeters in diameter.

Pores evenly distributed, number per square millimeter 2 to 4; solitary

or 2 to 4 connected; solitary pores are round in outline, their diameter 150 to 300μ; length of the vessel segments 450 to 700μ. Wood fibers 25 to 30μ, in diameter, length 1,000 to 2,000μ, wall 3 to 4μ thick. Wood parenchyma paratracheal and scattered; paratracheal parenchyma often elongating tangentially. Pith rays heterogeneous; uniseriate rays 1 to 7 cells high, cells upright; polyseriate rays 2 to 6 cells wide, 8 to 25 cells high, always flanked by large upright ray cells. No. 22143 B. F.

151) **Ficus benjamina** *Linnaeus*

Pores evenly distributed, number per square millimeter 1 or 2; tyloses often present; mostly solitary, oval or round in outline, their diameter 200 to 450μ, length of the vessel segments 350 to 500μ, their perforation simple. Wood fibers 20 to 28μ in diameter, length 1,000 to 2,000μ, wall 1 to 2μ thick. Wood parenchyma metatracheal, 3 to 10 cells wide in radial direction. Pith rays heterogeneous, 1 to 5 cells wide, up to 45 cells high, upright ray cells sometimes with crystals of calcium oxalate; horizontal resin canals rarely present. No. 17586 B. F.

152) **Ficus malunuensis** *Warburg*

Number of pores per square millimeter 1 or 2; usually solitary, oval or round in outline, their diameter 120 to 250μ, length of the vessel segments 220 to 400μ. Wood fibers 25 to 28μ in diameter, length 800 to 1,600μ, wall 2μ thick. Wood parenchyma metatracheal. Pith rays heterogeneous, up to 6 cells wide; upright ray cells very often with crystals of calcium oxalate. No. 17540 B. F.

153) **Ficus variegata** *Blume*

Number of pores per square millimeter 1 to 4, solitary or 2 to 4 connected radially; solitary pores are oval or round in outline, their diameter 150 to 300μ, length of the vessel segments 400 to 600μ. Wood fibers 20 to 30μ in diameter, length 900 to 1,800μ, wall 3μ thick. Wood parenchyma metatracheal, 3 to 10 cells wide. Pith rays heterogeneous, up to 10 cells wide. No. 17545 B. F.

Juglandaceae

154) **Engelhardtia spicata** *Blume*

Pores evenly distributed, number per square millimeter 2 to 4, usually solitary, they are oval or elliptic in outline, their diameter radially 150 to 260μ,

tangentially 120 to 200μ, length of the vessel segments 400 to 1,000μ, their perforation simple, rarely scalariform, cross bars then 4 to 6, side walls 3μ thick. Wood fibers 20 to 25μ in diameter, length 900 to 2,000μ; wall 2 to 3μ thick. Wood parenchyma metatracheal, paratracheal and scattered; metatracheal bands in wavy tangential lines, variably distanced from each other, 1 to 4 cells wide in radial direction. Pith rays heterogeneous, 1 to 3 fibers distant from each other, 1 to 3 cells wide, uniseriate ray cells large and upright; polyseriate rays 8 to 30 cells high, usually flanked by large upright ray cells. No. 22395 B. F.

Cupuliferae

155) **Quercus bennettii** *Miquel*

A tree up to 70 centimeters in diameter.

Pores arranged in radial direction, number per square millimeter 3 or 4; tyloses present; their diameter radially 160 to 300μ, tangentially 150 to 280μ, length of the vessel segments 500 to 1,000μ, end walls horizontal or slanting, their perforation simple. Wood fibers 14 to 16μ in diameter, length 1,000 to 2,000μ, wall 4μ thick. Wood parenchyma metatracheal and scattered, the former arranged in regular tangential lines, usually 1 to 4 cells wide in radial direction; chambered parenchyma cells present in great number, with crystals of calcium oxalate. Large pith rays up to 30 cells wide, large ray cells with crystals of calcium oxalate. No. 12934 B. F.

Coniferae

156) **Taxus wallichiana** *Zuccarini*

Resin cells absent. Diameter of early wood tracheids 20 to 30μ, length 1,800 to 3,000μ, wall 3 to 6μ thick; the inner surface of the wall with spiral thickenings. Pith rays uniseriate, 1 to 16 cells high; radial wall of each ray parenchyma cell with 1 or 2 sometimes 3 semi-bordered pits in early wood, in late wood 1 or 2. No. 7914 B. F.

157) **Agathis alba** (*Lamarck*) *Foxworthy*

One of the largest trees of Philippines, reaching 200 centimeters or more in diameter.

Resin cells normally absent. Diameter of early wood tracheids 40 to 80μ, length 2,500 to 5,200μ; wall 3 to 5μ in early wood, 5 to 7μ thick in late wood; bordered pits on the radial wall in 1 to 3 rows, arranged in

an alternate fashion; small bordered pits present on the tangential wall. Pith rays uniseriate, 1 to 15 cells high; radial wall of each parenchyma cell communicating with the adjacent tracheid with 3 to 6 semi-bordered pits. No. 7914 B. F.

158) **Podocarpus philippinensis** *Foxworthy*

Resin cells numerous, often connected tangentially. Diameter of early wood tracheids 30 to 55μ, length 1,200 to 3,000μ, wall 4 to 5μ in early wood, in late wood 5 to 8μ thick; radial bordered pits usually in one row. Pith rays uniseriate, 1 to 18 cells high; radial wall of each parenchyma cell with 2 or 3 semi-bordered pits in early wood, in late wood usually with one pit with linear apertue. No. 9508 B. F.

159) **Pinus merkusii** *Junghun*

A tree up to 90 centimeters in diameter.

Late wood sharply differentiated from early wood. Resin ducts both horizontal and vertical present. Diameter of early wood tracheids 40 to 80μ, radial diameter of late wood tracheids 20 to 40μ, tangential diameter 30 to 40μ, length 4,500 to 6,700μ, wall 4 to 6μ in early wood, in late wood 6 to 10μ thick; radial bordered pits in one sometimes two rows, bars of Sanio fairly distinct. Pith rays uniseriate, 1 to 16 cells high; upper and lower wall of small ray tracheids irregularly thickened; radial wall of each ray parenchyma cell with 1 to 3 sometimes 4 large simple pits. No. 22564 B. F.

160) **Pinus insularis** *Endlicher*

A moderately tall straight tree up to 140 centimeters in diameter.

Diameter of early wood tracheids 40 to 85μ, length 4,000 to 8,500μ, wall 4 to 6μ in early wood, in late wood 6 to 7μ thick. Pith rays uniseriate, 1 to 18 cells high; radial wall of each ray parenchyma cell with one sometimes two large simple pits. No. 5652 B. F.

PART II

AN ANATOMICAL KEY TO PHILIPPINE WOODS

a_1) Without vessels ... ... CONIFERAE

b_1) Resin ducts present ... ... *Pinus insularis, P. merkusii*

b_2) Resin ducts absent.

c_1) Resin cells present ... ... *Podocarpus philippinensis*

c_2) Resin cells absent.

d_1) Tracheids with spiral thickenings ... ...*Taxus wallichiana*

d_2) Tracheids without spiral thickenings ... ...*Agathis alba*

a_2) With vessels ... ... DICOTYLEDONS

b_1) Ring-porous woods. *

c_1) Pits rays 1 to 4 cells wide ... ... *Tectona grandis*

c_2) Pits rays 1 or 2 cells wide ... ... *Lagerstroemia speciosa*

b_2) Pores evenly distributed (diffuse-porous woods)

c_1) Resin ducts vertical or horizontal, present.

d_1) Vertical resin ducts may occur ... ... *Dipterocarpaceae*

d_2) Horizontal resin ducts occur.

e_1) Wood fibers septate.

f_1) Pith rays 1 or 2 cells wide.

g_1) Maximum diameter of pores up to 200μ ...*Santiria nitida*

g_2) Maximum diameter of pores up to 250μ ... ... *Koordersiodendron pinnatum*

f_2) Pith rays more than 3 cells in width.

g_1) Maximum diameter of pores less than 150μ ... ... *Canarium ovatum*

g_2) Maximum diameter of pores more than 220μ.

h_1) Diameter of fibers 30 to 40μ; pith rays 1 to 6 cells wide ... ... *Spondias pinnata*

h_2) Diameter of fibers 20 to 30μ; pith rays 1 to 3 cells wide ... ... *Dracontomelum edule*

* *Toona* and *Pterocarpus* are grouped as the ring-porous type by FOXWORTHY: Philip. Journ. Sci. Vol. 2, No. 5. 1907.

e_2) Wood fibers nonseptate.

f_1) Metatracheal parenchyma in distinct tangential line ... ... *Ficus benjamina*

f_2) Metatracheal parenchyma absent.

g_1) Pith rays homogeneous ... *Gymnartocarpus woodii*

g_2) Pith rays heterogeneous ... *Buchanania arborescens*

c_2) Resin ducts absent.

d_1) Pith rays homogeneous or nearly homogeneous.

e_1) Maximum number of pores per square millimeter less than 14.

f_1) Pith rays uniseriate, sometimes biseriate in part.

g_1) Ripple marks conspicuous on longitudinal section.

h_1) Wall of fibers 3 to 4μ thick... ... ... *Pterocarpus indicus, P. echinatus*

h_2) Wall of fibers 2μ thick ... *Dalbergia mimosella*

g_2) Ripple marks absent.

h_1) Pith rays always uniseriate ... *Zizyphus talanai*

h_2) Pith rays sometimes biseriate.

i_1) Metatracheal parenchyma conspicuous on transverse section.

j_1) Wall of fibers 6 to 8μ thick ... ... *Parinarium corymbosum*

j_2) Wall of fibers 3 to 4μ thick *Pometia pinnata*

i_2) Metatracheal parenchyma absent.

j_1) Wood fibers septate *Wallaceodendron celebicum*

j_2) Wood fibers nonseptate.

k_1) Wall of fibers 1 to 3μ thick *Pithecolobium scutiferum, Albizzia marginata*

k_2) Wall of fibers 4 to 6μ thick ... ... *Litchi philippinensis*

f_2) Pith rays more than 3 cells in width.

g_1) Chambered crystal-parenchyma present ... ... *Terminalia catappa*

g_2) Chambered crystal-parenchyma absent.

h_1) Metatracheal parenchyma in regular tangential lines

... ...*Cyathocalyx globosus*

h_2) Terminal parenchyma present ... *Sindora supa, Pahudia rhomboidea, Toona calantas*

h_3) Neither metatracheal nor terminal parenchyma present.

i_1) Paratracheal parenchyma elongating tangentially and often becoming more or less metatracheal ... ...*Adenanthera intermedia, Cassia javanica, Albizzia procera, A. acle, Erythrophloeum densiflorum, Samanea saman, Parkia timoriana, Indigofera zollingeriana*

i_2) Paratracheal parenchyma not conspicuous on transverse section.

j_1) Wall of fibers 2μ thick; tangential diameter of pith rays up to 40 ... *Octomeles sumatrana*

j_2) Wall of fibers 3 to 4μ thick; tangential diameter of pith rays up to 16μ...*Melia candollei*

e_2) Maximum number of pores per square millimeter more than 15.

f_1) Whether metatracheal or terminal parenchyma present.

g_1) Metatracheal parenchyma in regular tangential lines ... ... *Reinwardtiodendron Merrillii*

g_2) Metatracheal parenchyma irregularly distanced from each other ... ...*Murraya exotica*

g_3) Terminal parenchyma present.

h_1) Number of pores per square millimeter 57 to 72 ... ... *Dysoxylum turczaninowii*

h_2) Number of pores per square millimeter 12 to 16 ... ... *Aglaia clarkii*

f_2) Neither metatracheal nor terminal parenchyma present.

g_1) Wood contains flavone ... ... *Vitex parviflora*

g_2) Wood does not contain flavone ... ... *Radermachera pinnata, Vitex aherniana*

d_2) Pith rays heterogeneous.

e_1) Maximum number of pores per square millimeter less than 14.

f_1) Pith rays uniseriate sometimes biseriate in part.

g_1) Perforation of vessels scalariform... ... ... *Myristica philippinensis, Knema heterophylla*

g_2) Perforation of vessels simple.

h_1) Ripple marks present ... *Camptostemon philippinensis*

h_2) Ripple marks absent.

i_1) Wall of fibers more than 8μ in thickness.

j_1) Height of pith rays indefinitely great... ... ...*Garcinia dulcis*

j_2) Pith rays up to 20 cells in height ... ... *Fagraea cochinchinensis*

i_3) Wall of fibers less than 4μ in thickness.

j_1) Diameter of fibers 40 to 50 μ.

k_1) Pith rays always uniseriate *Bassia ramiflora*

k_2) Pith rays mostly uniseriate, sometimes biseriate ... ... *Endospermum peltatum*

j_2) Diameter of fibers 15 to 25μ.

k_1) Metatracheal parenchyma in distinct tangential lines.

l_1) Diameter of fibers 14 to 18μ. ... ... *Calophyllum inophyllum, C. blancoi*

l_2) Diameter of fibers 20 to 25μ ... ... *Terminalia calamansanai*

k_2) Metatracheal parenchyma present or absent; in the former case not distinct on transverse section.

l_1) Metatracheal parenchyma present but not conspicuous on transverse section ... ... *Gonystylus bancanus, Terminalia comintana*

l_2) Paratracheal parenchyma elongating tangentially and becoming metatracheal ... ... *Mangifera altissima*

f_2) Pith rays more than 3 cells in width.

g_1) Perforation of vessels scalariform ... ... *Dillenia sp.*

g_2) Perforation of vessels simple.

h_1) High rays present.

i_1) Wood contains flavone ... *Curallia integerrima*

i_2) Wood does not contain flavone.

j_1) Wall of fibers 8 to 12μ ... *Urandra luzoniensis*

j_2) Wall of fibers less than 4μ in thickness.

k_1) Ripple marks present.

l_1) Wood parenchyma are the principal elements of the wood ... *Erythrina indica*

l_2) Wood parenchyma are not the principal elements of the wood ... ...*Sterculia oblongata, S. foetida, Tarrietia sylvatica T. javanica, Pterocymbium tinctorium, Pterospermum niveum*

k_2) Ripple marks absent.

l_1) Metatracheal parenchyma in regular tangential lines ... *Polyalthia flava*

l_2) Metatracheal parenchyma irregularly arranged ... ... *Grewia stylocarpa*

h_2) High rays absent.

i_1) Large rays present ... ... *Quercus bennettii*

i_2) Large rays absent.

j_1) Metatracheal or terminal parenchyma present.

k_1) Metatracheal parenchyma in regular tangential lines.

l_1) Metatracheal parenchyma up to 10 cells wide in radial direction ... ... *Ficus variegata, F. malunuensis*

l_2) Metatracheal parenchyma less than 5 cells in width.

m_1) Wood fibers septate ... ... *Chisocheton philippinus*

m_2) Wood fibers nonseptate.

n_1) Metatracheal parenchyma one cell wide in radial direction.

o_1) Ripple marks present ... ... *Heritiera littoralis*

o_2) Ripple marks absent ... ...*Planchonia sp.*

n_2) Metatracheal parenchyma more than 2 cells in width.

o_1) Wall of fibers 4 to 6μ thick ... ... *Eugenia bordenii*

o_2) Wall of fibers 2 to 4μ thick ... ...*Engelhardtia spicata, Kingiodendron alternifolium*

k_2) Metatracheal parenchyma rather irregularly arranged.

l_1) Maximum diameter of fibers up to 18μ ... ... *Neonauclea calycina*

l_2) Maximum diameter of fibers up to 32μ ... *Sandoricum vidalii, S. indicum*

l_3) Maximum diameter of fibers up to 40μ ... ...*Ailanthus philippinensis*

k_3) Terminal parenchyma present ... ... *Cryptocaria bicolor*

j_1) Metatracheal parenchyma absent.

k_1) Wood fibers septate.

l_1) Diameter of fibers 15 to 20μ, wall 3 to 4μ thick ... *Dracontomelum dao*

l_2) Diameter of fibers 20 to 32μ; wall 2 to 4μ thick ... *Canarium aherianum, C. calophyllum, C. radlkoferi, C. villosum*

l_3) Diameter of fibers 25 to 40μ; wall 4 to 6μ thick ... ... *Bischofia javanica*

k_2) Wood fibers nonseptate.

l_1) Ripple marks present ... ...

f_1) Terminal parenchyma present ... ... *Wrightia laniti*

f_2) Metatracheal parenchyma arranged in regular tangential lines ... ... *Mimusops parviflora*

e_2) Maximum number of pores per square millimeter less than 25.

f_1) Wood parenchyma in regular tangential lines ... *Maba buxifolia, Diospyros philippinensis, D. pilosanthera, D. discolor, D. mindanaensis*

f_2) Metatracheal parenchyma absent.

g_1) Maximum diameter of pores up to 50μ *Kopsia longiflora*

g_2) Maximum diameter of pores more than 120μ.

h_1) Diameter of fibers 22 to 30μ, wall 5 to 6μ thick ... ... *Sonneratia pagatpat*

h_2) Diameter of fibers 16 to 18μ, wall 3 to 4μ thick ... ... *Lumnitzera littorea*

d_2) Pith rays more than 3 cells in width.

e_1) Metatracheal parenchyma absent ... *Ahernia glandulosa*

e_2) Metatracheal parenchyma present.

f_1) Perforation of vessels scalariform.

g_1) Number of pores per square millimeter 40 to 55 ... ...*Strombosia philippinensis*

g_2) Number of pores per square millimeter 11 to 16 ... ...*Cyclostemon grandifolius*

f_2) Perforation of vessels simple.

g_1) High rays present ... ... *Aporosa symplocosifolia*

g_2) High rays absent.

h_1) Diameter of fibers 14 to 18μ,

i_1) Wall of fibers 4 to 5μ thick ... ...*Eugenia clausa, E. glaucicalyx*

i_2) Wall of fibers 3 to 4μ thick ... ...*Sideroxylon macranthum*

h_2) Diameter of fibers 20 to 40μ.

i_1) Wall of fibers 2 to 3μ thick ... *Alstonia scholaris*

i_2) Wall of fibers 4 to 7μ thick... ... ... *Bassia betis, Palaquium philippense, P. luzoniense*

PART III

SUMMARY

I Occurrence of flavone derivatives in wood.

TABLE 1. Anthocyanin colour and intensity in some Philippine woods. (☼☼☼ indicates strongly coloured; ☼☼ moderately coloured; ☼ faintly coloured.)

Species	Colour of anthocyanin	Intensity
Artocarpus communis	Orange red	☼ ☼ ☼
Calophyllum blancoi	Crimson	☼ ☼ ☼
Calophyllum inophyllum	do	☼ ☼ ☼
Carallia integerrima	Scarlet	☼ ☼ ☼
Pithecolobium scutiferum	Orange red	☼ ☼ ☼
Vitex pariviflora	do	☼ ☼ ☼
Albizzia acle	do	☼ ☼
Albizzia procera	do	☼ ☼
Samanea saman	do	☼ ☼
Adenanthera intermedia	Violet red	☼ ☼
Artocarpus cumingiana	Orange red	☼
Garcinia benthami	do	☼
Garcinia dulcis	do	☼

The families of high flavone content in Philippine woods are *Urticaceae*, *Guttiferae*, *Leguminosae*, *Verbenaceae* and *Rhizophoraceae*.

II Fluorescence.

The fluorescence is generally intensified by adding ammonia solution but sometimes, though rare, it disappears as with *Neonauclea calycina*.

TABLE 2. Degree of fluorescence in some Philippine woods. (☼☼☼ = most pronounced fluorescence, apparent in the room; ☼☼ = more pronounced in camera; ☼ = detected only by help of camera; — = no fluorescence)

VI Maximum number of pores per square millimeter.

TABLE 5

Class	I	II	III	IV	V
Maximum number of pores per square millimeter	1-10	11-30	31-60	61-120	121-more
Number of species	87	55	7	3	0
Percentage	57.2%	36.2%	4.6%	2.0%	0

From the above table, the Philippine woods range in the order of I, II, III, IV.

VII Maximum diameter of pores.

In the following table it is classified according to the maximum diameter, excluding ring-porous woods.

TABLE 6

Class	I	II	III	IV	V	VI
Maximum diameter	less than 50 μ	51-100 μ	101-150 μ	151-200	201-300 μ	more than 300 μ
Number of species	1	8	27	34	60	22
Percentage	0.6%	5.2%	17.8%	22.4%	36.5%	14.5%

From the above table they range in the order of V, IV, III, VI, II, I.

VIII Perforation of vessels.

Considering the form of perforation, we may chiefly distinguish between (1) *simple* and (2) *scalariform* perforation; though there are various form, they are mostly modifications or malformations of these two principal types.

The following are the Philippine genera with scalariform perforation.

TABLE 7

Cyclostemon	Knema
Dillenia	Myristica
Hydnocarpus	Strombosia

Beilschmiedia and *Urandra* are simple-scalariform type.

IX Spiral markings or striations in vessels.

Spiral markings in vessels seem to be influenced by climatic conditions and in the tropics there are very few species with spirals. Among the Philippine woods investigated, there are only five species which have spiral markings or striations in vessel. The following are the species:

TABLE 8

* Aporosa symplocosifolia	* Toona calantas
* Garcinia benthami	* Phoebe sterculioides
Melia candollei	

* With striations.

X Arrangement of wood parenchyma.

This is very important feature in classifying woods. It is generally divided into four groups (1) *paratracheal,* (2) *metatracheal* (3) *terminal* and (4) *scattered.* Terminal parenchyma is only a form of (2). (1) and (4) occur in most woods and from a diagnostic point of view (2) present the most important features. Metatracheal parenchyma occur very frequently in Philippine woods. Out of 155 species, 94 species, that is 60.6% have metatracheal parenchyma.

XI Pith rays.

Pith rays are very important for diagnostic purposes. They are divided into two ways according to the shape of the ray cells: they may be *homogeneous* or *heterogeneous* and according to the arrangement of the ray cells they may be (1) *high rays,* that is pith rays higher than one millimeter or (2) *ordinary*

rays, when the rays are less than one millimeter in height. There are still other kinds of pith rays; *large rays* and *compound* or *false rays*, but these are confined to special genera such as *Quercus*, *Alnus* etc.

The following is the list of the Philippine genera with homogeneous rays.

TABLE 9

Anonaceae	*Sapindaceae*	Farinarium
Cyathocalyx	Lichi	*Lythraceae*
Dipterocarpaceae	Pometia	Lagerstroemia
†Hopea	*Leguminosae*	*Datiscaceae*
†Shorea	Adenanthera	Octomeles
Lineae	Albizzia	*Bignoniaceae*
Reinwardtiodendron	Cassia	Radermachera
Rutaceae	Dalbergia	*Verbenaceae*
Murraya	Erythrophloeum	Tectona
Meliaceae	Pahudia	Vitex
Aglaia	Parkia	*Urticaceae*
Dysoxylum	Pithecolobium	Artocarpus
Melia	†Pterocarpus	*Cupuliferae*
Toona	Sindora	Quercus
Rhamnaceae	Wallaceodendron	
Zizyphus	*Rosaceae*	

† Some species with heterogeneous rays.

The following is the list of Philippine genera with high rays:

TABLE 10

Anisoptera	Erythrina	Polyalthia
Antidesma	Garcinia	†Shorea
Aporosa	Grewia	Sterculia
Carallia	†Hopea	Strombosia
Cyathocalyx	Hydnocarpus	Tarrietia
Dillenia	Pentaeme	

† Some species with ordinary rays.

The following are the Philippine species with uniseriate or sometimes biseriate rays:

TABLE 11

Aglaia clarkii	Mangifera altissima
Albizzia marginata	Medinilla sp
Bassia ramiflora	Mimusops parviflora
Calophyllum blancoi	Murraya exotica
Calophyllum inophyllum	Myristica philippinensis
Camptostemon philippinensis	Parinarium corymbosum
Canarium radlkoferi	Pithecolobium scutiferum
Cyclostemon grandifolius	Pometia pinnata
Dalbergia mimosella	Pterocarpus echinatus
Diospyros spp.	Pterocarpus indicus
Fagraea cochinchinensis	Reinwardtiodendron merrillii
Garcinia dulcis	Santiria nitida
Gonystylus bancanus	Sonneratia pagatpat
Knema heterophylla	Terminalia calamansanai
Kopsia lengiflora	Temrminalia comintana
Koordersiodendron pinnatum	Wallaceodendron celebicum
Lagerstroemia spp.	Wrightia laniti
Lumnitzera littorea	Xanthostemon verdugonianus
Maba buxifolia	Zizyphus talanai

Illustrations

FIG. 1. *Dipterocarpus polyspermus*, transverse section of wood, showing vertical resin canals x350.

2. *Shorea eximina*, transverse section of wood, showing vertical resin canals arranged in tangential lines x70.

3. *Shorea sp. near guiso*, transverse section of wood, showing tyloses and paratracheal parenchyma x70.

4. *Grewia stylocarpa*, transverse section of wood x70.

5. *Sandoricum Vidalii*, transverse section of wood, showing discontinuous metatracheal parenchyma x70.

6. *Spondias pinnata*, transverse section of wood x70.

7. *Xylocarpus granatum*, tangential section of wood, showing septate fibers and pith rays arranged in horizontal series x70.

8. *Wallaceodendron celebicum*, transverse section of wood, showing scattered parenchyma cells with crystals of calcium oxalate x70.

9. *Bassia ramiflora*, transverse section of wood, showing large cavities of fibers x70.

10. *Diospyros pilosanthera*, transverse section of wood, showing metatracheal bands in tangential lines x70.

11. *Myristica philippinensis*, transverse section of wood, showing metatracheal parenchyma x70.

12. *Knema heterophylla*, transverse section of wood, showing metatracheal parenchyma x70.

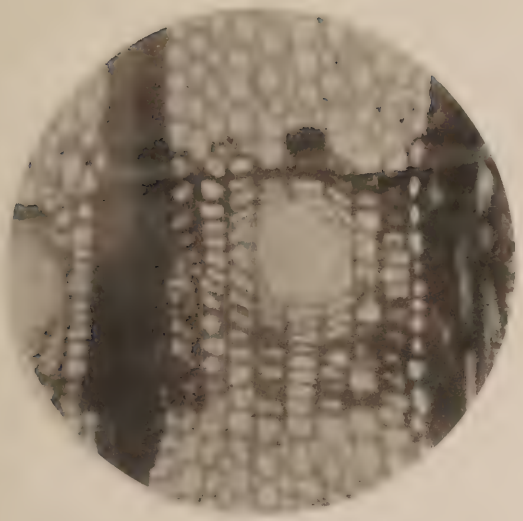

Fig. 1 Dipterocarpus polysperma

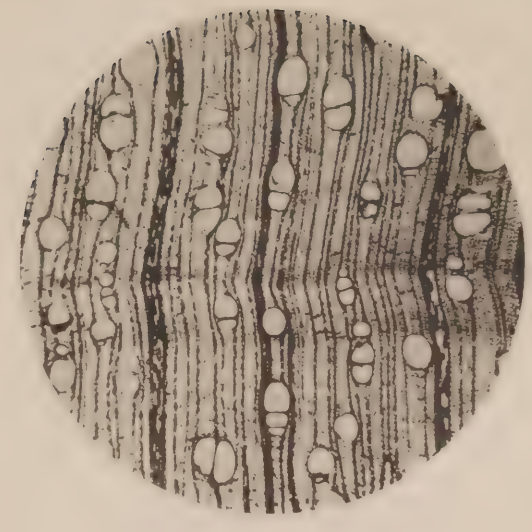

Fig. 4 Grewia stylocarpa.

Fig. 2 Shorea eximia.

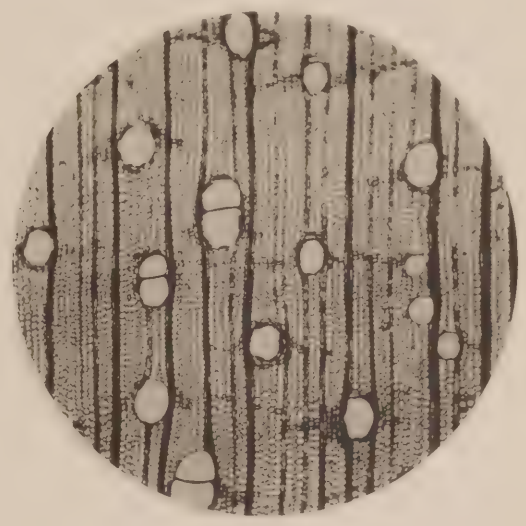

Fig. 5 Sandoricum Vidalii.

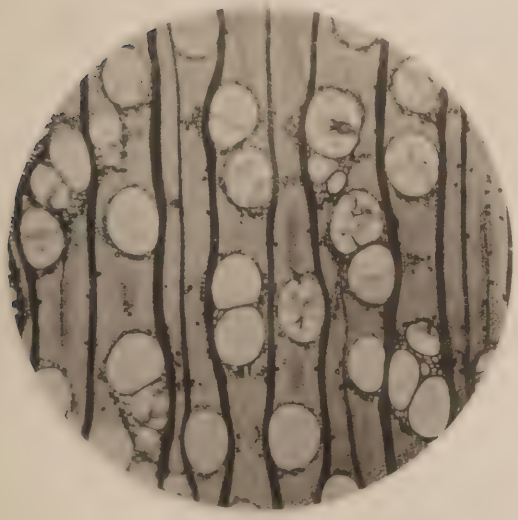

Fig. 3 Shorea, near guiso

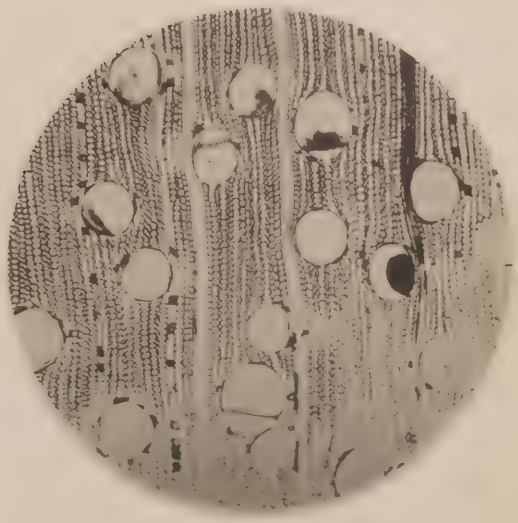

Fig. 6 Spondias pinnata

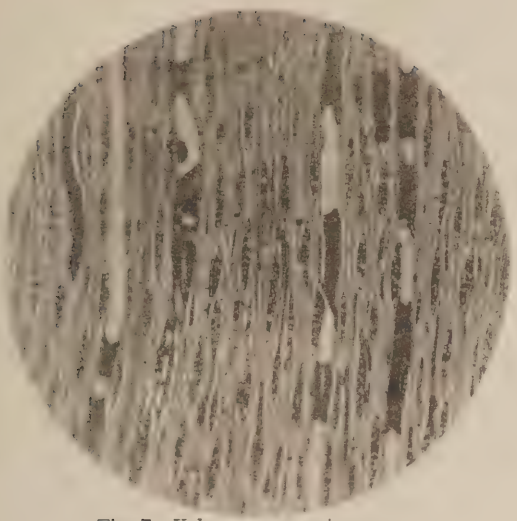

Fig. 7 Xylocarpus granatum.

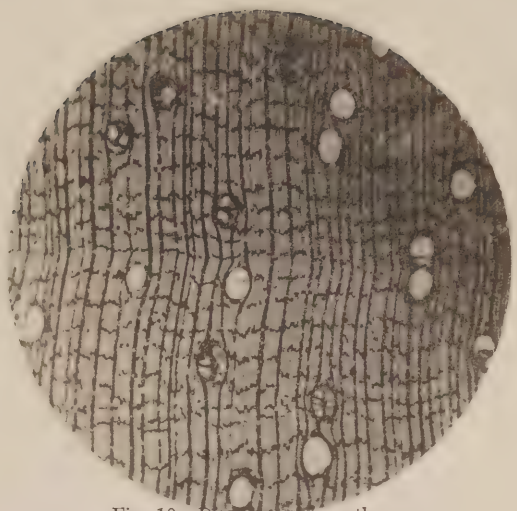

Fig. 10 Diospyros pilosanthera.

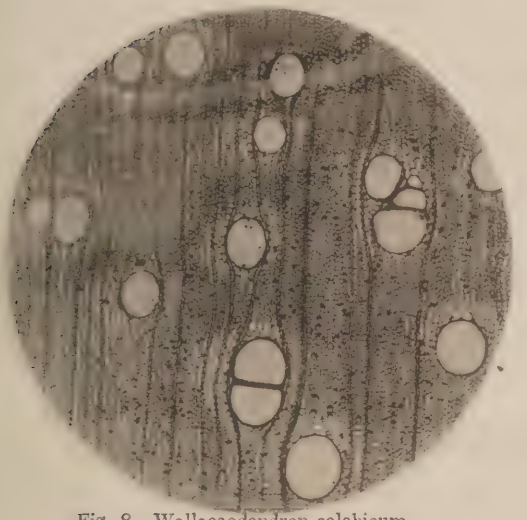

Fig. 8 Wallaceodendron celebicum.

Fig. 11 Myristica philippinensis.

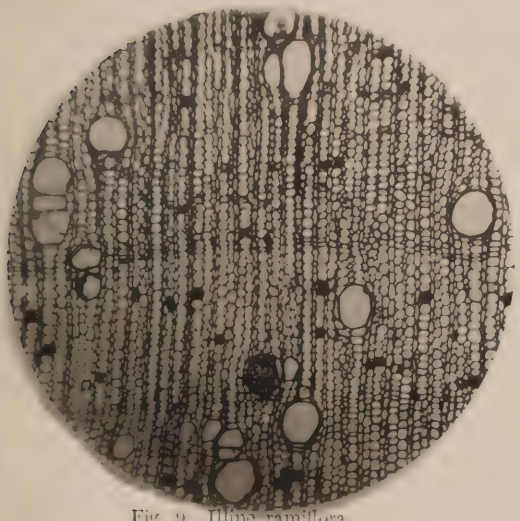

Fig. 9 Illipe ramiflora.

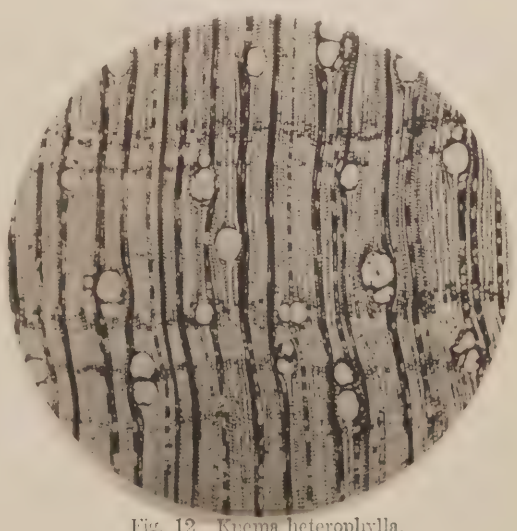

Fig. 12 Knema heterophylla.

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